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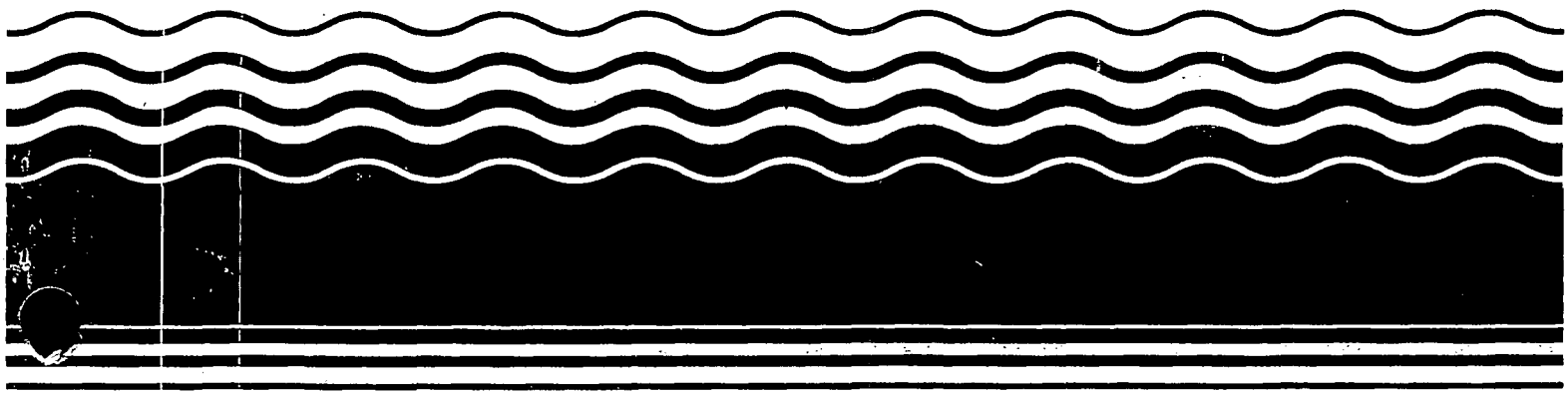
EPA Superfund Record of Decision:

Hercules Inc., (Gibbstown Plant), Solid Waste Disposal Area, Operable Unit 3, Greenwich Township, Gloucester County, NJ 1/22/1996



SUPERFUND RECORD OF DECISION

HERCULES INCORPORATED
GREENWICH TOWNSHIP
GLOUCESTER COUNTY
NEW JERSEY

Prepared by: NJ Department of
Environmental Protection
Site Remediation Program
Bureau of Federal Case Management

JANUARY 1996

HERCULES INCORPORATED SITE
RECORD OF DECISION

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Statement of Basis and Purpose

This decision document presents the selected remedial action for the Solid Waste Disposal Area (SWDA) - Operable Unit 3, Hercules Incorporated, Higgins Plant (hereinafter Hercules site or site), in Greenwich Township, Gloucester County, New Jersey, which was chosen in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) 42 U.S.C. &9611 et. seq., and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR Part 300 et. seq. The New Jersey Department of Environmental Protection (NJDEP or Department) maintains an Administrative Record at the NJDEP Information Resource Center in Trenton and at the Gibbstown Public Library. Detailed in Section 5 herein, the Administrative Record Index contains a listing of the documents which formed the basis of the Department's selection of the remedy. This decision document explains the factual and legal basis for selecting the remedy at the site.

Assessment of the Site

Actual or threatened releases of hazardous substances from this site, if not addressed by the selected remedial alternative or one of the other active measures considered, may present a current or potential threat to public health, welfare or the environment.

Description of the Selected Remedy

The Record of Decision (ROD) addresses all contaminated media at the SWDA portion of the site including soil and ground water. The selected remedy is a modified version of the "In-Place Containment" remedy of the Proposed Plan.

The major components of the selected remedy are:

- Screening and collection for recycling of lead fragments from within the SWDA.
- Consolidation of tar material and miscellaneous solid wastes under an impermeable cap. The impermeable cap will include a protective sub-layer and an impermeable synthetic liner beneath two feet of clean soil and an upper vegetative layer.
- Implementation of engineering and institutional controls such as fencing and environmental use restrictions.
- Establishment of a Classification Exception Area (CEA) for ground water underneath and surrounding the SWDA. This will include annual evaluation of ground water quality by the Department. An evaluation will determine whether the remedy achieves federal Maximum Contaminant Levels (MCLs) as well as New Jersey Ground Water Quality Standards (NJGWQS).
- Filling of the North Ditch with a 24-inch layer of clean imported soil.

- o Compensation/mitigation for natural resource damages.

Declaration of Statutory Determinations

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost effective. The selection of this remedy considered permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent possible, and satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as their principal element.

This remedy will result in hazardous substances remaining on-site above health based levels. Therefore, a review will need to be conducted pursuant to CERCLA every 5 years to ensure that the remedy continues to provide adequate protection of human health and the environment.

Signature

Richard J. Cimello
Assistant Commissioner
Site Remediation Program

Date

1/25/96

DECISION SUMMARY

Decision Summary for the Record of Decision
Hercules, Inc. Site
Solid Waste Disposal Area (SWDA)-Operable Unit 3
Gibbstown, New Jersey

1. SITE DESCRIPTION

The Hercules site is located at the end of North Market Street in Gibbstown, Greenwich Township, Gloucester County, New Jersey. The site consists of approximately 350 acres and is bounded by the Delaware River to the north, Mobil Oil Corporation's (Mobil) petroleum refinery to the east, the community of Gibbstown to the south, and E.I. du Pont de Nemours Incorporated's (DuPont) manufacturing plant to the west. The site is approximately one mile west of Interstate 295. Clonmell Creek, a tributary of the Delaware River, runs northwest through the middle of the site. The site consists of developed and undeveloped uplands with swampy inner lowland areas extending between Clonmell Creek and the Delaware River.

Hercules' manufacturing facilities cover approximately 40% of the southern portion of the site. The SWDA, which is the subject of this Record of Decision (ROD), consists of approximately 4 acres and is situated between the plant's manufacturing facilities and a levee which runs along the Delaware River (Delaware River levee) to the north. Ground surface elevations range from a maximum of 18 feet above mean sea level (msl) at the southern end of the site to a minimum of 2 feet above msl at the northern end of the site adjacent to the Delaware River.

The Hercules site is located within the Atlantic Coastal Plain Physiographic Province. This geologic province is characterized by the presence of a sequence of thick unconsolidated sand, silt, gravel and clay. The major stratigraphic units present in the area are from oldest to youngest: Pre-Cambrian Age (greater than 600 million years) crystalline basement rocks, deposits of Cretaceous Age (135-60 million years old) Potomac-Raritan-Magothy Formation, Pleistocene Age (500,000 to 11,000 years old) deposits of the Trenton Gravel (formerly referred to as the Cape May Formation), and Holocene (11,000 years old to present) alluvial deposits on the Delaware River floodplain. The geology underlying the SWDA consists of the surficial Peat/Clay and underlying Sand unit.

The Hercules property north of Clonmell Creek, including the SWDA, is within the 100 year floodplain of the Delaware River. The SWDA proper is classified as a disturbed old field forested upland. The SWDA is composed of two tar disposal areas with intermingled solid wastes which are transected by a dirt access road. The Delaware River levee separates the SWDA and the Delaware River. A prominent swale located north of the SWDA and at the base of the Delaware River levee is referred to as the North Ditch. A remnant of a manmade system of ditches used to convert wetlands to farmland during the 1940s, the North Ditch has been determined to be a closed system with no inlet or outlet.

2. SITE HISTORY

In 1952, the Hercules Powder Company obtained the area which encompasses the SWDA from DuPont. Historical aerial photographs reveal that tars present within the SWDA were placed there prior to Hercules' purchase of the property. Reportedly, tars generated by aniline production at the DuPont facility were transported by rail car and tank trucks and disposed of in the SWDA. Lead fragments from lead troughs and tubs were also reportedly disposed of in this area. From 1955 to 1974 Hercules used the SWDA to dispose of mixed waste materials from manufacturing processes at the Gibbstown Plant. According to plant personnel, a road was built to accommodate dump trucks travelling to and from the main plant to the SWDA.

This road was also used for the maintenance of the plant's waste water treatment discharge line. Waste disposal ended in 1974 and the area has remained inactive since that time.

A report entitled "Water Quality Data for the Potomac-Raritan-Magothy Aquifer System, Trenton to Pennsville, New Jersey, 1980" was released in 1981 which documented volatile organic (benzene) ground water contamination found in production well 4 (PW4) at Hercules. In December 1982, as a consequence of this investigation and the existence of tar pits and disposal areas located in the northern portion of the plant property (the SWDA), Hercules was listed on the National Priorities List (NPL). In 1983, Hercules initiated Remedial Investigations and Feasibility Studies (RI/FS) for the entire site. In 1984, Hercules commenced contaminated ground water recovery, treatment, and disposal for the main plant.

In July 1986, Hercules entered into an Administrative Consent Order (ACO) with the NJDEP. The ACO required Hercules to continue operation of its existing ground water treatment system and to investigate all other areas of concern at the site. Initial investigations identified the SWDA as separate and distinct from all other areas of the site. Therefore, Hercules conducted a separate and distinct investigation of the SWDA. This Record of Decision (ROD) will address the SWDA of the Hercules site.

3. ONGOING OR COMPLETED REMEDIAL PROGRAMS

As with many Superfund sites, the problems at the Hercules site are complex. As a result, NJDEP has currently organized the remedial work into three operable units. These units consist of contaminated ground water, on-site soils, and the SWDA. In 1984, as an interim measure, Hercules commenced recovery and treatment of contaminated ground water from the main plant portion of the site. On-site soils are currently being investigated as contaminated soils appear to be the source of much of the ground water contamination and are a direct contact threat to site workers. The third operable unit is the SWDA. The selected remedy for the SWDA is a modified version of the In-Place Containment remedy presented in the Proposed Plan. This remedy will include maintenance and upgrading of control measures, the implementation of environmental use restrictions, creation of a CEA, and ground water monitoring.

The SWDA has undergone three phases of remedial investigation. Phase I was initiated in May 1987 and was conducted over a one year period. Phase I included historical research concerning disposal practices and delineation of the SWDA, as well as soil and ground water sampling.

Phase II, implemented in 1989, intended to further define the extent and distribution of wastes, determine the characteristics of the tar and other materials disposed of in the SWDA, further address the presence or absence of possible contamination in the soils and ground water surrounding the SWDA, and identify any relationships between waste and ground water in the SWDA. Phase II also provided additional information with respect to areal extent of contamination, amount of contamination, and disposition of the tar. Additionally, Phase II confirmed that ground water flow is predominately south toward the main part of the plant and fluctuates with tidal conditions in the Delaware River.

Phase III was initiated in 1993 in order to collect additional miscellaneous information and data which was needed to further delineate contamination found in the SWDA. This information would ultimately be used in order to determine an appropriate remedy based upon the areas of concern which comprise the SWDA.

4. SITE CHARACTERISTICS

The media of concern within the SWDA are described below:

TAR MATERIAL

The tar pits in the SWDA are estimated to cover a total area of approximately 158,600 square feet, including both exposed tars and tars covered by the solid waste materials. The tar material is a distillation by-product from the purification of aniline and contains diphenylamine, N-nitrosodiphenylamine, benzidine, aniline, phenols and metals. The thickness of the tar is believed to be varying, with an average thickness of 3 feet. Samples of the tar were collected from the SWDA in order to quantify the physical characteristics of the tar for an engineering evaluation of capping options. The data collected confirmed observations taken in the field that the tar can resist some loading at low temperatures, but at elevated temperatures the tar has minimal load bearing capacity. The tar in its pure state (aniline still bottoms) has been characterized as a heavy liquid displaying characteristics similar to those of No.6 fuel oil. At cold temperatures, typical of winter conditions, the exposed tar becomes rigid and has the capacity to carry significant loads (e.g., it can be walked on with little or no deformation). It is known that the tar material, at temperatures existing beneath ground surface has sufficient bearing capacity to support the weight of the solid waste because the tar is overlain in many places by as much as 4 to 6 feet of solid waste. The bearing capacity or strength of the tar is believed to result from a combination of its high viscosity and confined in-situ state.

SOILS

Soils underlying the tar contain benzo(a)pyrene, diphenylamine, phenols, and metals in low levels. Benzo(a)pyrene at 830 ug/kg was the only constituent exceeding the NJDEP Soil Cleanup Criteria. Lead was the only metal found in the form of solid fragments within the SWDA. This lead is leachable and exceeds the TCLP leachate standard of 5 mg/L. Pesticides found in the soil were not manufactured by Hercules and are considered generic to the region.

MISCELLANEOUS SOLID WASTES

Based on the Phase III RI Report, the miscellaneous solid waste piles within the SWDA contain plant process wastes and inert construction debris including waste scrap material, spent alkylation catalyst, cumic acid, sodium thiocyanate filter cake, DALPAC (butylated hydroxy toluene, BHT) and off-specification materials contaminated with toluene, phenol, p-cresol, di-tertiary butyl p-cresol, di-methylbenzyl alcohol, and dicumyl peroxide. These wastes cover an area of 93,650 square feet and are unaffected by volume change due to material degradation. The physical behavior of these wastes seems fairly consistent throughout the waste mass, yet the mass is highly heterogeneous and varying in thickness.

GROUND WATER

As mentioned previously, in 1984 Hercules implemented a ground water recovery system to control off-site migration of contaminated ground water from the main portion of the plant. In 1991 as part of this system, an expanded waste water treatment plant began operations. Migration of chemical compounds to the upper portion of the Potomac-Raritan-Magothy (PRM) aquifer is impeded beneath the SWDA where the peat/clay layering is present. No chemical compounds were detected in the lower portion of the PRM aquifer above current NJGWQS. The Phase II study of the SWDA confirmed that ground water flow is predominately south toward the main part of the plant and fluctuates with tidal conditions in the Delaware River. There is also a slight net downward vertical hydraulic gradient in the water table due to heavy ground water usage in the surrounding area. The final Phase III RI Report for the SWDA related ground water flow to tidal activity, stating that ground water flow is influenced by tidal activity, precipitation, surface water runoff and leakage from the Delaware River levee. Ground water quality is influenced by the slight exceedances of volatile organic compound (VOC) standards in the immediate vicinity of the solid waste and tar pits (specifically MW-13 and MW-40 see Figure 5). These exceedances are not detected in down gradient

monitoring wells. Total lead and total chromium detections (unfiltered sample analysis) in MW-41, MW-42, MW-43 exceeded the current NJGWQS (see Figure 6). The primary constituents of concern are toluene, cumene, benzene, 2,4 and 2,6 dinitrotoluene, arsenic, lead, nickel, and zinc. Dissolved phase constituents were not detected in monitoring wells near the Delaware River.

SURFACE WATER

Concentrations of aluminum, lead, zinc and DDT detected in surface water from the North Ditch exceeded the Federal Ambient Water Quality Criteria. Since the ditch represents a closed system, the constituents found in the North Ditch do not migrate out of the ditch.

SEDIMENTS

Concentrations of cumene, diphenylamine, phenols, PAHs, PCBs, and pesticides were detected in North Ditch sediments exceeding NOAA Criteria. The sediments do not appear to impact ground water quality as evidenced by monitoring wells located between the SWDA and the North Ditch.

AIR QUALITY

Results of air sampling indicate that VOCs are not being released from the SWDA under ambient conditions. Thus, no contaminant transport mechanisms via air were detected.

5. HIGHLIGHTS OF COMMUNITY PARTICIPATION

The RI/FS Report and the Proposed Plan for the SWDA were released to the public for comment on July 27, 1994. These two documents in addition to the documents detailed below were made available to the public in both the administrative record and information repositories maintained at the NJDEP Information Resource Center, at the Gibbstown Public Library and at the Greenwich Township Municipal Building. The notice of availability for these two documents was published in the Gloucester County Times on July 27, 1994. A public comment period on the Proposed Plan was held from July 27, 1994 to August 25, 1994. In addition, a public meeting was held on August 10, 1994. At this meeting, representatives from NJDEP answered questions about problems at the site and the remedial alternatives under consideration. A response to the comments received during this period is included in the Responsiveness Summary, which is part of this ROD.

The documents listed below which comprise the Administrative Record for this ROD, were made available to the public for review:

- Administrative Consent Order entered into between Hercules and NJDEP; Paragraph 34 requires Hercules investigation of the Solid Waste Disposal Area (July 1986)
- Phase I Work Plan (September 1986)
- Results of Phase I Investigation of the Solid Waste Disposal Area (March 1988)
- Addendum to Results of Phase I Investigation (September 1988)
- Phase II Investigation Scope of Work (September 1988)
- Phase II Supplemental Investigation Scope of Work (February 1989)
- Phase II Remedial Investigation Results, Solid Waste Disposal Area, Higgins Plant (June 1989)
- Phase II Addendum, Hercules Plant (June 1990)
- Phase III Remedial Investigation Work Plan and Quality Assurance Project Plan, QAPP (April 1992)
- Response to Comments on Phase III Remedial Investigation Work Plan (June 1992)
- Revised QAPP for the Solid Waste Disposal Area Remedial Investigation (June 1992)
- Revised Table 4-1 of the QAPP (July 1992)
- Analytical Method for Differentiation of Diphenylamine/Nitro-

sodiphenylamine in QAPP (August 1992)

- o Phase III Remedial Investigation, Solid Waste Disposal Area (February 1993)
- o NJDEP Approval of Remedial Investigation Activities (May 1993)
- o Final Revised Feasibility Study (October 1993)
- o Revised Risk Assessment (December 1993)

6. SUMMARY OF SITE RISK

Based upon the results of the RI, a baseline risk assessment was conducted to estimate the risks associated with current and future site conditions. The baseline risk assessment estimates the human health and ecological risk which could result from the contamination at the site if no remedial action were taken. Site risks are expressed in exponential terms when estimating the cancer risk. For example, 1×10^{-6} excess cancer risk estimate means that a person exposed to contaminants in the SWDA would experience a one in one-million excess risk of developing cancer over their lifetime. Risk of health effects other than cancer are expressed in terms of a calculated Hazard Index. A Hazard Index greater than one (1.0) for an individual exposed to site contaminants in a specified manner over a lifetime would indicate a potential for health effects other than cancer.

Human Health Risk Assessment

The conservative estimate of reasonable maximum human exposure is evaluated. A four-step process is utilized for assessing site-related human health risks for a reasonable maximum exposure scenario: *Hazard Identification*--identifies the contaminants of concern at the site based on several factors such as toxicity, frequency of occurrence, and concentration. *Exposure Assessment*--estimates the magnitude of actual and/or potential human exposures, the frequency and duration of these exposures, and the pathways (e.g., ingesting contaminated well-water) by which humans are potentially exposed. *Toxicity Assessment*-- determines the types of adverse health effects associated with chemical exposures, and the relationship between magnitude of exposure (dose) and severity of adverse effects (response). *Risk Characterization*-- summarizes and combines outputs of the exposure and toxicity assessments to provide a quantitative (e.g., one-in-a-million excess cancer risk) assessment of site-related risks.

Reference doses (RfDs) have been developed by EPA for estimating excess adverse health effects from exposure to chemicals exhibiting noncarcinogenic effects. RfDs, which are expressed in units of mg/kg-day, are estimates of lifetime daily exposure levels for humans, including sensitive individuals, that are not likely to be without an appreciable risk of adverse health effects. Estimated intakes of chemicals from environmental media (e.g., the amount of a chemical ingested from contaminated drinking water) can be compared to the RfD. RfDs are derived from human epidemiological studies or animal studies to which uncertainty factors have been applied (e.g., to account for the use of animal data to predict effects on humans). These uncertainty factors help ensure that the RfDs will not underestimate the potential for adverse noncarcinogenic effects to occur.

Cancer potency factors (CPFs) have been developed by EPA's Carcinogenic Assessment Group for estimating excess lifetime cancer risks associated with exposure to potentially carcinogenic chemicals. CPFs, which are expressed in units of $(mg/kg\text{-}day)^{-1}$, are multiplied by the estimated intake of a potential carcinogen, in mg/kg-day, to provide an upper-bound estimate of the excess lifetime cancer risk associated with exposure at that intake level. The term "upper bound" reflects the conservative estimate of the risks calculated from the CPF. Use of this approach makes underestimation of the actual cancer risk highly unlikely. Cancer potency factors are derived from the results of human epidemiological studies or chronic animal bioassays to which animal-to-human extrapolation and uncertainty factors have been applied.

Excess lifetime cancer risks are determined by multiplying the intake level with the cancer potency factor. These risks are probabilities that are generally expressed in scientific notation (e.g., $1x10^{-6}$ or 1E-6). An excess lifetime cancer risk of $1x10^{-6}$ indicates that, as a plausible upper bound, an individual has a one in one million chance of developing cancer as a result of site-related exposure to a carcinogen over a 70-year lifetime under the specific exposure conditions at a site.

Potential for noncarcinogenic effects from a single contaminant in a single medium is expressed as the hazard quotient (HQ) (or the ratio of the estimated intake derived from the contaminant concentration in a given medium to the contaminant's reference dose). By adding the HQs for all contaminants within a medium or across all media to which a given population may reasonably be exposed, the Hazard Index (HI) can be generated. The HI provides a useful reference point for gauging the potential significance of multiple contaminant exposures within a single medium or across media.

The baseline risk assessment began with selecting contaminants of concern which would be representative of site risks (see Table 5). These contaminants included benzene, cumene, 2,4-dinitrotoluene, 2,6-dinitrotoluene, diphenylamine, arsenic, benzidine, chromium, benzo(a)pyrene, and mercury. Three of the contaminants, arsenic, benzene, and benzidine, are known to cause cancer in laboratory animals and are known to be human carcinogens.

The baseline risk assessment evaluated the health effects which could potentially result from exposure to contamination as a result of dermal contact, ground water ingestion, inhalation of released chemicals and incidental inhalation of soil and waste. The potentially affected population consists of an occasional employee and adult trespasser. Younger children were not considered part of the potentially exposed population due to the limited access and terrain in the immediate vicinity of the SWDA.

Under the hypothetical ground water use conditions, employees at the Hercules facility represented the potentially affected population. Exposure pathways evaluated are: a) inhalation of VOCs and skin contact with and ingestion of compounds detected in ground water at the source area; b) skin contact with and incidental ingestion of surface soil and tar; and c) skin contact with and incidental ingestion of surface water and sediments at the North Ditch. Inhalation was not considered an exposure pathway as VOCs generally have not been detected in tar and surface soil samples, and field screening instruments used during intrusive sampling events did not detect VOCs. The possibility of the above exposures actually occurring is remote as the area is virtually inaccessible to the public and the majority of plant employees. Access to the SWDA is limited to a few personnel at the plant who have keys to the locked gate separating the SWDA waste from the main plant portion of the site. There is a remote possibility that the occasional trespasser walking along the Delaware River levee could access the area. There are no plans to develop or expand current plant operations in the immediate vicinity of the SWDA.

Summary of Health Risks

The results of the baseline risk assessment indicate that the tar and tar/soils at the site pose an unacceptable risk to human health. The maximum carcinogenic risk is associated with direct exposure to tar and tar/soils. The risk for a worker or adult trespasser is estimated to be $8x10^{-3}$. This risk number means that an individual exposed to the contaminants with the frequency and duration outlined in this scenario would experience an 8 in 1,000 excess risk of developing cancer. Benzidine is the chemical of concern which is primarily responsible for the potential risk associated with tar exposure.

The Hazard Index, which reflects noncarcinogenic effects for a human receptor, was estimated to be 0.57 for all media combined. The Hazard Index does not exceed 1.0, indicating that non-carcinogenic health effects are not of concern at the site. Current federal guidelines for acceptable exposures are a maximum health

Hazard Index equal to 1.0 and an individual lifetime excess carcinogenic risk in the range of 10^{-4} to 10^{-6}. The State of New Jersey has developed remedial criteria based on the risk level of 1 x 10^{-6} for carcinogens and a Hazard Index of 1.0 for noncarcinogens.

As discussed previously, ground water quality has exhibited elevated concentrations of VOCs in the immediate vicinity of the SWDA. However, there is no evidence that VOCs have migrated to down gradient monitoring wells. Thus VOC exceedances have not been determined to pose a threat to local potable wells or to the Delaware River. Additionally, the selected alternative will establish a CEA pursuant to the NJGWQS N.J.A.C. 7:9-6 et seq. for ground water underneath and surrounding the SWDA which will restrict the use of ground water for potable purposes.

Actual or threatened releases of hazardous substances from this site, if not addressed by the selected alternative or one of the other active measures considered, may present a current or potential threat to public health, welfare or the environment.

Ecological Risk Assessment

The reasonable maximum environmental exposure is evaluated. A four-step process is utilized for assessing site-related ecological risks for a reasonable maximum exposure scenario: *Problem Formulation*-- a qualitative evaluation of contaminant release, migration, and fate; identification of contaminants of concern, receptors, exposure pathways, and known ecological effects of the contaminants; and selection of endpoints for further study. *Exposure Assessment*--a quantitative evaluation of contaminant release, migration, and fate; characterization of exposure pathways and receptors; and measurement or estimation of exposure point concentrations. *Ecological Effects Assessment*--literature reviews, field studies, and toxicity tests, linking contaminant concentrations to effects on ecological receptors. *Risk Characterization*--measurement or estimation of both current and future adverse effects.

The ecological risk assessment began with evaluating the contaminants associated with the site in conjunction with the site-specific biological species/habitat information. Direct exposure to the tar/soils and tar pits within the SWDA represents the dominant pathway of site-related contaminants to terrestrial wildlife that frequent or inhabit the SWDA. The major transport mechanism of site contaminants to the aquatic communities within the common reed wetland and the North Ditch appears to be from runoff and overland flow from the SWDA. Exposure to the sediment and surface water represents the dominant pathway of contaminants to aquatic invertebrates, fish, reptiles, amphibians, and waterfowl. The transitory presence of potentially contaminated tadpoles and invertebrates within the North Ditch provides a pathway by which transient migratory species, especially wading birds may ingest the contamination. Low level estimated concentrations of pesticides and PCB concentrations were highest at the reference station and likely represent background conditions in the area.

The results of the ecological risk assessment indicate that the contaminated soils, sediment, and tar may pose some risk at the site. No acute impacts were observed in the aquatic organisms within the North Ditch. The compounds detected in the North Ditch are likely sorbed onto the high organic content sediments. Since the ditch represents a closed system, these constituents do not migrate out of the Ditch. No acute impacts were noted in wildlife observed during field reconnaissance. The SWDA has a limited wildlife habitat and the vegetation present does not provide quality food for wildlife, therefore, limited exposure would only occur to species which occasionally pass through the SWDA. However, since chronic exposure to site related contaminants will persist, implementation of remedial actions will eliminate the possibility of chronic exposures to the communities now subject to risk.

SCOPE AND ROLE OF ACTION

The remediation of the Hercules site will consist of at least three operable units with separate and distinct Records of Decision. One will address the SWDA area (the subject of this ROD) and the remaining two will address contaminated ground water and the main plant portion of the site. The purpose of this remedial action is to alleviate the risk to human health and the environment associated with the SWDA at the Hercules Plant. This is a separate and distinct operable unit which is unique in character and location with respect to the overall site.

The most serious risk from the SWDA is direct exposure of hazardous substances to a transient population of wildlife and the occasional plant employee or trespasser. Therefore, the proposed remedies must address these concerns. Limiting access to the area and limiting exposure pathways from the hazardous substances should result in all risk associated with this area being within acceptable levels. Restricting the use of the ground water will also eliminate exposure to risk through ingestion of ground water.

7. SUMMARY OF REMEDIAL ALTERNATIVES

CERCLA requires that each selected remedy be protective of human health and the environment; be cost effective; comply with other statutory laws; and utilize permanent solutions, alternative treatment technologies, and resource recovery alternatives to the maximum extent practicable. In addition, the statute includes a preference for the use of treatment as a principle element for the reduction of toxicity, mobility, or volume of the hazardous substances.

Identification and screening of potential remedial technologies for tars and solid wastes were reviewed for purposes of the Feasibility Study. Several of these technologies were identified but eliminated during preliminary assessments due to lack of effectiveness, implementability, or pertinence. The following technologies were initially screened out: aeration, in-situ biodegradation, in-situ vitrification, soil flushing, solvent extraction, stabilization/ solidification, thermal desorption, and vapor extraction. Subsequent screening of remedial technologies reduced the list to four.

The FS Report evaluates the four (4) remedial alternatives for addressing the contamination associated with the Solid Waste Disposal Area of the Hercules site in detail.

These alternatives are:

1. No Action
2. Limited Action
3. In-Place Containment
4. On-Site Incineration/Off-Site Disposal and Ground Water Pump and Treat

A brief description of each of the remedial alternatives is provided below:

Alternative #1 - No Action:

The Superfund program requires that the "no-action" alternative be considered as a baseline for comparison of all other alternatives. The No Action alternative consists of long-term periodic site inspection and ground water monitoring. Because this alternative would result in contaminants remaining on-site, CERCLA requires that the site be reviewed every five years. If justified by the review, remedial actions may be implemented to remove or treat the waste.

Capital Cost: $ 0.00
Annual Cost: $10,060
Present Worth Cost: $201,040
Time to Implement: 6 months

Alternative #2 - Limited Action:

This alternative requires periodic inspection, ground water monitoring and institutional controls that would reduce the potential for exposure to site contaminants. Specifically, semi-annual inspections would be made of the entire SWDA, annual ground water sampling and analysis would be performed, environmental use restrictions and engineering controls would be imposed, and a perimeter fence would be installed around the SWDA. Because this alternative would result in contaminants remaining on-site, CERCLA requires that the site be reviewed every five years. If justified by the review, additional remedial actions may be implemented to remove or treat the solid waste and tar.

Capital Cost: $256,750
Annual Cost: $11,060
Present Worth Cost: $478,000
Time to Implement: 1 year

Alternative #3 - In-Place Containment:

Under this alternative tar material and miscellaneous solid wastes would be consolidated and remain under a flexible, impermeable cap. Prior to the placement of select soils from within the SWDA, lead fragments would be screened out and collected for recycling. An engineering control in the form of a fence would be installed to prevent trespassers and unauthorized personnel from entering the area. Inspections, ground water monitoring, and institutional controls would also be implemented. Specifically, semi-annual visual inspections of the SWDA would be performed. Ground water sampling and analysis would occur. Environmental use restrictions and engineering controls would be imposed. The smaller outlying tar material areas and miscellaneous solid wastes from the entire SWDA would be consolidated with the large tar pits, regrading of the area will also occur, an impermeable cap would be put in place over the tar and solid waste, and storm water controls would be instituted. The impermeable cap would consist of a multi-layer system consisting of an upper vegetative layer underlain by approximately 2 feet of clean soil, an impermeable synthetic membrane liner and a protective sub-layer for the liner, or the "equivalent". This cap would be keyed into the existing native soil to prevent migration of the tars during temperature fluctuations. The existing contaminated sub-soil would be graded and inspected for large protrusions which may breech the integrity of the liner. All damages to natural resources will be mitigated/compensated for. All necessary permits will be secured.

In addition, the NJDEP will designate a CEA for ground water underneath and surrounding the SWDA. Because the ground water quality exceedances do not currently pose an unacceptable threat to local potable wells or the Delaware River, active ground water remediation is not included in this alternative for the SWDA. The designation of the CEA and the Department's acceptance of monitoring for the ground water remedy does not preclude the Department from requiring an active ground water recovery system should deterioration in the ground water quality occur in this area. This can be accomplished by installing recovery wells down gradient of the SWDA and linking into the existing on-site water treatment system. Because this alternative would result in contaminants remaining on-site, CERCLA requires that the site be reviewed every five years. If justified by the review, remedial actions may be implemented to remove or treat contaminated media.

Capital Cost: $1,715,107
Annual Cost: $17,460
Present Worth Cost: $1,956,000
Time to Implement: 3 years

Alternative #4 - On-Site Incineration, Off-Site Disposal and Ground Water Pump and Treat System

This alternative requires excavation of miscellaneous solid wastes within the SWDA, screening for lead fragments, and off-site disposal of the solid waste. The tar would be excavated and staged for on-site incineration as would some of the solid wastes which would be commingled with the tar. The resultant ash would be disposed of off-site. Although the ground water in the vicinity of the SWDA has been observed to be only minimally impacted by site constituents, ground water recovery and treatment has been evaluated in this ROD for completeness. Treatment of ground water, if necessary, would be accomplished using the existing Hercules treatment facility. Annual ground water monitoring would be performed and institutional controls would be imposed to restrict future water usage. Lead fragments would be mechanically screened and recycled. Pre-construction activities would be performed that include construction of a staging area, access road improvements, clearing and grubbing of vegetation, institution of erosion and sedimentation controls, and partial replacement of an existing waste water pipeline. In addition, a remote area would be cleared for the construction of a permanent or mobile incinerator. Wetland permits would be necessary due to the extensive intrusive work required in the wetlands and in the North Ditch. The structuring and operational permitting of an on-site incinerator would also be required. Additional backfilling and grading in the SWDA would be required to promote proper storm water drainage. All damages to natural resources would be mitigated/compensated for.

Capital Cost: $ 36,728,250
Annual Cost: $7,360
Present Worth Cost: $36,875,000
Time to Implement: 5 years

8. SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

During the detailed evaluation of remedial alternatives, each alternative was assessed against nine evaluation criteria. These criteria are: overall protection of human health and the environment, compliance with applicable or relevant and appropriate requirements, long term effectiveness and permanence, reduction of toxicity, mobility, or volume, short-term effectiveness, implementability, cost, and EPA and community acceptance.

- o Overall Protection of Human Health and the Environment

  Overall protection of human health and the environment addresses whether or not a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls. Overall protection of human health and the environment represents a threshold criterion.

- o Compliance with ARARs

  Compliance with applicable or relevant and appropriate requirements (ARARs) addresses whether or not a remedy will meet all of the applicable or relevant and appropriate requirements of other federal and state environmental statutes and requirements or provide grounds for invoking a waiver.

- o Long-Term Effectiveness and Permanence

  Long-term effectiveness and permanence refers to the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup goals have been met.

- Reduction of Toxicity, Mobility, or Volume through Treatment

  Reduction of toxicity, mobility, or volume through treatment is the anticipated performance of the treatment technologies a remedy may employ.

- Short Term Effectiveness

  Short-term effectiveness addresses the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period until cleanup goals are achieved.

- Implementability

  Implementability is the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.

- Cost

  Cost includes estimated capital and operation and maintenance costs, and net present worth costs.

- EPA Acceptance

  EPA concurrence indicates whether the federal regulatory agency concurs, opposes, or has no comment on the selected remedy. EPA concurrence is not a prerequisite in NJDEP's selection of a remedial alternative.

- Community Acceptance

  Community acceptance assesses the public comments received on the RI/FS Reports and the Proposed Plan.

  Community concerns/comments received during the public comment period and the public meeting held on August 10, 1994, are included in the Responsiveness Summary, together with NJDEP responses, which are a part of this ROD. Community concerns/comments received generally indicate that the community accepts the preferred alternative identified in the Proposed Plan and selected in the ROD.

A comparative analysis of these alternatives based upon the evaluation noted above follows:

- Overall Protection of Human Health and the Environment

Alternative #1 - No Action

The only activities performed on-site would be periodic inspections and ground water monitoring. Therefore, there would be no significant short-term risks associated with this alternative. The existing carcinogenic risk due to direct contact with the tar material and the potential for migration of constituents would not be reduced. This alternative would not adequately satisfy the remedial action objectives in terms of potential risk to public health.

Alternative #2 - Limited Action

This alternative would reduce the potential for exposures to site constituents through institutional controls such as site fencing and environmental use restrictions. However, the potential for migration of constituents would not be reduced. For all media except the tar, this alternative would adequately satisfy the remedial action objectives in terms of potential risk to public health.

Alternative #3 - In-Place Containment

This alternative would mitigate the potential for direct contact with the tar material and miscellaneous solid wastes. The potential for migration of constituents due to surface erosion would also be mitigated. Periodic site inspections and maintenance would ensure the longevity of the cover, and ground water monitoring would provide an assessment of changes in the ground water quality. Additionally, the impermeable liner will help prevent ground water degradation from potential leaching of hazardous constituents from the solid waste material. Short-term risks associated with the extraction of small quantities of tar and solid wastes would be mitigated through proper health and safety procedures.

Alternative #4 - On-Site Incineration and Off-Site Disposal

This alternative would eliminate the potential for direct contact with the tar material and miscellaneous solid wastes. Annual ground water monitoring and environmental use restrictions would be imposed to restrict future water usage. Treatment of ground water, if deemed necessary, would utilize Hercules existing water treatment facility. The short-term risks associated with this alternative would be significantly greater than for Alternative 3, because of the large quantities of tar to be excavated, staged, and incinerated on site. Potential risks would be associated with the removal of both residual tar ashes and solid wastes from the site.

- o Compliance with ARARs

Alternative #1 - No Action

This alternative would not comply with the Federal MCLs and NJGWQS, which are ARARs. The most seriously affected ground water is in the immediate vicinity of the waste materials. However, detections of constituents in the ground water have been inconsistent and at low parts per billion (ppb) levels since sampling was begun. There are no current users of this ground water. Additionally, the NJDEP soil cleanup criteria, which are "to be considered" (TBCs), would not be met. Concentrations of pesticides and metals in the surface water in the North Ditch currently exceed the Federal Ambient Water Quality Criteria. The only action specific ARAR which applies to the no action alternative is compliance with the New Jersey Water Pollution Control Act, which will require a permit for long term monitoring under O & M.

Alternative #2 - Limited Action

This alternative would not comply with the Federal MCLs and NJGWQS, which are ARARs. The most seriously affected ground water is in the immediate vicinity of waste materials. Detections of constituents in the ground water have been inconsistent and at low ppb levels since sampling was begun. There are no current users of this ground water. Concentrations of pesticides and metals in the surface water in the North Ditch currently exceed Federal Ambient Water Quality Criteria. Additionally the NJDEP soil cleanup criteria, which are TBCs, would not be met. However, contact with these media would be reduced by site fencing and restrictions on future land use and well installations. Action specific ARARs could be complied with and would include obtaining all the permits necessary to construct the fence and commence with sampling activities associated with O & M.

Alternative #3 - In-Place Containment

This alternative would not meet the Federal MCLs and NJGWQS, which are ARARs. The most seriously affected ground water is in the immediate vicinity of the waste materials. Detections of constituents in the ground water have been inconsistent and at low ppb levels since sampling began. There are no current users of this ground water. Concentrations of pesticides and metals in the surface water in the North Ditch exceed current Federal Ambient Water Quality Criteria. Sediments within the North Ditch exceed NOAA Criteria which are TBCs. Additionally, the

NJDEP soil cleanup criteria, which are TBCs, would not be met. However, contact with waste materials would be reduced by site fencing, capping of the waste materials and tar, and restrictions on future land use and well installations. Also, filling in the North Ditch with clean imported fill material will preclude direct contact with sediments. Action specific ARARs would be complied with and would include obtaining all the permits necessary to implement the remedy and begin with sampling activities associated with O & M.

Location specific ARARs would be satisfied by the imposition of environmental use restrictions and establishment of a ground water CEA in the vicinity and including the SWDA.

Alternative #4 - On-Site Incineration and Off-Site Disposal

This alternative would provide compliance with chemical specific ARARs and TBCs. If all of the tar and the contaminated soil and sediments are removed, the remedy will meet the cleanup specific ARARs. Ground water ARARs may not be met by treatment or monitoring, but treatment and/or natural attenuation would reduce site-related contamination over time. Concentrations of pesticides and metals in the surface water in the North Ditch exceed current Federal Ambient Water Quality Criteria. Location and action specific ARARs may be difficult to meet as extensive work in wetlands and the North Ditch would be required. On-site incineration permits may not be easily obtained and complete removal of the tar would be extremely difficult and technically challenging.

- o Long-Term Effectiveness and Permanence

Alternative #1 - No Action

This alternative would provide little to no long-term effectiveness and permanence. All existing risk due to direct contact with the tar/tar soils and solid waste would remain. This alternative may also increase the potential for a more serious ground water problem over time. No Action may also increase the potential for additional contamination in the North Ditch.

Alternative #2 - Limited Action

This alternative would provide a low to moderate level of long-term effectiveness and permanence, as the existing risk due to direct contact with the tar material would be reduced by restricting access with a perimeter fence, but the potential for exposure would still exist. The potential would continue to exist for degradation of other site media by surface migration of contaminants.

Alternative #3 - In- Place Containment

This alternative would provide a moderate to high level of long-term effectiveness and permanence as long as the impermeable cap is maintained and the environmental use restrictions are enforced. The risk due to direct contact with the tar and the potential for surface migration of the contaminants would be mitigated.

Alternative #4 - On-Site Incineration and Off-Site Disposal

This alternative would provide a high level of long-term effectiveness and permanence. The risk due to direct contact with the tar and the potential for surface migration of the constituents would be mitigated. The level of long-term permanence would be higher for this alternative than that of Alternative 3, as the tar and solid wastes would be removed from the site. The only potential long-term concern of tar incineration would stem from the off-site disposal of the incinerator ash and the potential liability associated with this disposal.

- Reduction in Toxicity, Mobility, or Volume

Alternative #1 - No Action

This alternative would provide no reduction in the mobility, toxicity and volume of affected media, as no remedial actions would be performed.

Alternative #2 - Limited Action

This alternative would provide no reduction in the mobility, toxicity and volume of affected media. The implementation of institutional controls would serve only to reduce the potential for direct exposure.

Alternative #3 - In-Place Containment

This alternative would provide no reduction in toxicity, or volume of affected media. However, mobility of contaminants would be reduced due to placement of the wastes beneath the cap. Placement of an impermeable cap will prevent oozing of tars/tar sludges through the surface cover when warm temperatures make the tars more fluid. Without an impermeable membrane, soft tars could theoretically breech the soil cover and present an exposure hazard. Because the ground water is in contact with the tar at some locations, the potential for mobility of all constituents into the ground water would not be mitigated. However, there are no current users of the ground water. The cap will restrict exposure of the waste to precipitation events and a ground water CEA will be created. Periodic monitoring will permit assessment of any changes in ground water quality.

Alternative #4 - On-Site Incineration and Off-Site Disposal

This alternative would provide a high level of reduction in mobility, toxicity and volume of affected media. In particular, this alternative provides reduction in the toxicity and volume of the tar, as this component is destroyed by incineration. Placement of the solid waste and residual ash in an off-site landfill would result in additional volume reduction at the site only.

- Short-Term Effectiveness

Alternative #1 - No Action

This alternative would provide no short term effectiveness. The environmental impacts would be low as no additional wetlands are disturbed by this alternative. All current risk levels would remain.

Alternative #2 - Limited Action

This alternative would provide moderate short term effectiveness. The environmental impacts would be limited to wetlands disturbance for fence construction.

Alternative #3 - In-Place Containment

This alternative would provide a moderate level of short-term effectiveness. A consolidation and grading of the miscellaneous solid wastes and proper installation of the cap would increase the potential for exposure to on-site workers, and to a lesser extent potentially expose off-site communities due to fugitive dust emissions. Proper health and safety and construction controls could be readily implemented to mitigate these short-term effects (i.e., dust suppression and air monitoring). Wetland communities have the potential to be greatly disturbed in the construction phase of this remedy as almost all of the construction takes place in wetlands. However, all damages to natural resources will be mitigated/compensated for.

Alternative #4 - On-Site Incineration and Off-Site Disposal

This alternative would provide a low level of short-term effectiveness as excavation of the tar for on-site incineration and consolidation and off-site disposal of solid waste and residual ash would increase the potential for exposure to on-site workers and off-site communities due to fugitive dust and organic emissions. Proper health and safety and construction controls would be required to mitigate these short-term effects. This alternative would result in the maximum disruption and impact to the wetland areas compared to the other alternatives due to necessary staging of incineration equipment and materials associated with these activities. All natural resource damages would be mitigated/compensated for.

- o Implementability

Alternative #1 - No Action

This alternative would be easily implemented as it requires only periodic inspections and ground water monitoring.

Alternative #2 - Limited Action

This alternative would be easily implemented as it requires only periodic inspections, ground water monitoring, environmental use restrictions on land and ground water, and installation and maintenance of perimeter fencing. This alternative is both technically and administratively feasible.

Alternative #3 - In-Place Containment

This alternative would have a moderate to high level of implementability. In-Place Containment is both technically and administratively feasible. The equipment, labor, and materials required to implement this alternative are readily available. The subsurface conditions would require proper engineering design and strict construction quality assurance controls.

Alternative #4 - On-Site Incineration and Off-Site Disposal

This alternative would have a low level of implementability. An extremely high amount of technical effort is required for excavation, dewatering, on-site handling, staging, on-site incineration, and off-site disposal of the residual ash and solid waste. Solid waste and residual ash removal would be difficult due to the wetland environment and the engineering properties of the tar. During the summer the tar becomes softer making it difficult to excavate; pumping would be virtually impossible since the majority of it is mixed with the underlying subsurface soils and overlying miscellaneous solid waste. Winter is typically not favorable for construction due to short working days and extreme weather conditions.

The tar is solid in the winter, however, as it's manipulated it becomes softer. Its stability as a hardened solid is questionable. In addition, trial burns and operational permitting required for the above activities are extensive and incineration has low acceptability levels in most communities. Off-site transportation of residual ash would require implementation of optimal transportation routes to minimize the potential exposure to local populations and compliance with federal and state regulations for transport of hazardous waste.

- o Cost

Alternative #1 - No Action:

This alternative has a relatively low present worth of $201,040. The primary goal of the No Action Alternative consists of long-term periodic site inspections and ground water monitoring.

Alternative #2 - Limited Action:

This alternative has a present worth cost of $478,000. In addition to restricted access by the installation of perimeter fencing, environmental use restrictions and engineering controls on future land and ground water use would be imposed. In addition, semi-annual inspections would be made of the entire SWDA and annual ground water monitoring would be performed.

Alternative #3 - In-Place Containment:

This alternative has a present worth cost of $1,956,000. The primary components of this remediation are screening and recycling of lead fragments, consolidation of the remaining select soils and contaminants under an impermeable cap, semi-annual inspection of the SWDA, ground water monitoring, and the imposition of environmental use restrictions and institutional controls on future land and ground water usage. All damages to natural resource will be mitigated/compensated for.

Alternative #4 - On-Site Incineration and Off-Site Disposal:

This alternative has a present worth cost of $36,875,000. The primary components are screening of lead fragments, dewatering, excavation, staging, and on-site incineration of tar, off-site disposal of residual ash, excavation and off-site removal of miscellaneous solid wastes. This option would also include semi-annual inspections of the SWDA, ground water monitoring, and the imposition of environmental use restrictions and engineering controls on future land and ground water usage. All damages to natural resources will be mitigated/compensated for.

o EPA Acceptance

EPA has reviewed and commented on the proposed plan. While EPA concurrence on this plan is not a pre-requisite to NJDEP selecting a remedy, every effort has been made to maintain consistency within and between the agencies. EPA concurred with NJDEP's selection of In-Place Containment of the solid wastes and tars within the SWDA. However, EPA did not concur with NJDEP's selection of the No Action Alternative for the North Ditch. Therefore, NJDEP modified its position with respect to the North Ditch by selecting the Filling Alternative for the North Ditch.

o Community Acceptance

Community acceptance assesses the public comments received on the RI/FS Report and the Proposed Plan.

Community concerns/comments received during the public comment period and public meeting held on August 10, 1994 are included in the responsiveness summary, which is part of this ROD. Community concerns/comments received indicate that the community accepts the preferred alternative identified in the Proposed Plan and identified in the ROD herein.

9. SELECTED REMEDY

Based upon an evaluation of the various alternatives and after consideration of public comments, NJDEP has determined that a Modified Alternative #3 (In-Place Containment) is the appropriate remedy for the SWDA operable unit of the Hercules Incorporated, Higgins Plant Superfund site because it best satisfies the requirements of CERCLA and the NCP's nine evaluation criteria for the remedial alternatives.

The modification to Alternative #3 concerns remedial activities in the North Ditch. The Department has chosen to modify the remedy indicated in the proposed plan by including the Filling Alternative for the North Ditch. This would eliminate any potential ecological risks associated with direct contact with

contaminated sediments. All damages to wetlands through implementation of this remedy will be mitigated/compensated for.

Ground water monitoring will be conducted to evaluate ground water quality. Consolidation of the tar and miscellaneous solid wastes under an impermeable cap will eliminate direct contact with the hazardous constituents within the SWDA and is protective of human health and the environment. Collection and recycling of lead fragments from the area will reduce concentrations of this contaminant from the SWDA. Fencing and storm water controls will protect the integrity of the cap. Fencing will also increase the protectiveness of the remedy by limiting access to the area. The designation of the CEA will eliminate ground water use in and around the vicinity of the SWDA.

The selected alternative achieves the ARARs more quickly, or as quickly as the other options. The selected alternative will provide the best balance of trade-offs among alternatives with respect to the evaluating criteria. NJDEP believes that the selected alternative will be protective of human health and the environment, will comply with ARARs, employs resource recovery technologies and will be cost effective to the maximum extent practicable.

The total costs for Alternatives #1, #2, #3, and #4 are $201,040, $478,000, $2,320,312 and $36,875,000, respectively. Alternative #3, In-Place Containment is a non-permanent remedy that originally had an associated cost of $1,956,000 but as modified now has a cost of $2,320,312. Alternative #4, On-Site Incineration and Off-Site Disposal, is the only permanent remedy available for the tar with an associated cost of $36,875,000. Alternative #3 is the option of choice.

Since the SWDA would not be effectively excavated and treated due its large size and the absence of hot-spots representing major sources of ground water contamination, none of the implementable alternatives considered satisfied the statutory preference for treatment as a principal element of the remedy with respect to source control.

10. STATUTORY DETERMINATIONS

Under their legal authorities, NJDEP's and EPA's primary responsibility at Superfund sites is to undertake remedial actions that achieve adequate protection of human health and the environment. In addition, section 121 of CERCLA establishes several other statutory requirements and preferences. These specify that when complete, the selected remedial action for this site must comply with applicable or relevant and appropriate environmental standards established under State and Federal environmental laws unless a statutory waiver is justified. The selected remedy also must be cost effective and utilize permanent solutions and alternative treatment technologies to the maximum extent practicable. Finally, the statute includes a preference for remedies that employ treatment that permanently and significantly reduce the volume, toxicity, or mobility of hazardous wastes as their principal element.

The selected remedy is protective of human health and the environment, complies with State and Federal requirements that are legally applicable or relevant and appropriate requirements for the remedial action and is cost effective. This remedy utilizes permanent solutions and alternate treatment technologies to the maximum extent practicable for this site. This remedy will require the institution of a CEA. Because this remedy includes leaving hazardous substances on-site, a review will be conducted every five (5) years after commencement of the remedial action to ensure the remedy continues to provided adequate protection of human health and the environment.

The selected remedy will not meet Federal MCLs and NJGWQS, which are ARARS. However, the most seriously affected, ground water in the immediate vicinity of the SWDA, has exhibited low levels since the onset of sampling. Additionally, there are no current users of ground water. Concentrations of pesticides and metals in the surface water of the North Ditch exceed current Federal Ambient

Water Quality Criteria. Sediments within the North Ditch exceed NOAA Criteria which are TBCs. Finally, NJSCC, which are TBC's would not be met. However, contact with waste materials would be reduced by site fencing, capping of the waste materials, filling in the North Ditch, and restrictions on future land use and well restrictions.

Action specific ARARS will be achieved at a significantly lower cost and with minimal disturbance to the surrounding neighbors and community than the other options. The selected alternative will provide the best balance of trade-offs among all the alternatives with respect to the CERCLA nine criteria. NJDEP has selected a modified In-Place Containment as the remedial alternative because it will comply with ARARs to the maximum extent practicable, will utilize permanent solutions and alternative treatment technologies to the maximum extent practicable, will be cost effective, and will create a minimal disturbance to the surrounding community during the remediation process.

11. DOCUMENTATION OF SIGNIFICANT CHANGES

NJDEP had indicated during the public meeting held on August 10, 1994 that No Action had been selected for the North Ditch. The North Ditch was addressed in the Feasibility Study, but a specific alternative analysis was not performed in the Proposed Plan.

As discussed in Section 9. above, EPA concurs with In-Place Containment of the solid wastes and tars within the SWDA. However, EPA did not concur with NJDEP's selection of the No Action Alternative for the North Ditch. The EPA's stated position is that No Action for the North Ditch may not provide for adequate protection of wildlife and the environment. The Department reevaluated EPA's concern regarding a No Action alternative for the North Ditch. Upon completion of this evaluation, the modification, as discussed in the Feasibility Study, was added to Alternative #3 (See # 9 above, SELECTED REMEDY).

GLOSSARY

This glossary defines the technical terms used in this Record of Decision. The terms and abbreviations contained in this glossary are often defined in the context of hazardous waste management, and apply specifically to work performed under the Superfund program. Therefore, these terms may have other meanings when used in a different context.

Administrative Consent Order: A legal and enforceable agreement between EPA or the State and the potentially responsible parties (PRPs). Under the terms of the Order, the PRPs agree to perform or pay for site studies or cleanup work. It also describes the oversight rules, responsibilities and enforcement options that the state government may exercise in the event of non-compliance by the PRPs. This Order is signed by the PRPs and the state government; it does not require approval by a judge. The federal equivalent of the Administrative Consent Order is the Administrative Order or Consent.

Aquifer: An underground layer of rock, sand, or gravel capable of storing water within cracks and pore spaces, or between grains. When water contained within an aquifer is of sufficient quantity and quality, it can be tapped and used for drinking or other purposes. The water contained in the aquifer is called ground water.

ARAR: An acronym for "Applicable or Relevant and Appropriate Requirements". ARARs may be chemical, location, or action specific and include federal standards and more stringent state standards that are legally applicable or relevant and appropriate under the circumstances.

Backfill: To refill an excavated area with removed earth; or the material itself that is used to refill an excavated area.

Cap: A layer of material, such as clay or a synthetic material, used to prevent precipitation from penetrating and spreading contaminated materials. The surface of the cap is generally mounded or sloped so water will drain off.

CERCLA: (Comprehensive Environmental Response, Compensation, and Liability Act of 1980) A Federal law passed in 1980 and modified in 1986 by the Superfund Amendments and Re-authorization Act (SARA). The Act created a special tax to fund a Trust Fund, commonly known as the Superfund, to investigate and remediate abandoned or uncontrolled hazardous waste sites. Under the program, EPA can either:

1) pay for site remediation when parties responsible for the contamination cannot be located or are un-willing or unable to perform the work; or

2) take legal action to force parties responsible for site contamination to remediate the site or pay back the Federal government for the cost of the remediation.

Classification Exception Area (CEA): These are areas which may be established by the NJDEP only when the NJDEP determines that constituent standards for a given classification are not being met, will not be met for a period of time, or cannot be met for a period of time in a localized area due to: natural quality; localized effects of a discharge approved through a NJPDES permit action; pollution caused by human activity within a contaminated site as defined by the NJDEP in the context of an applicable regulatory program (for example, Site Remediation Program Oversight Document).

Containment: The process of enclosing or containing hazardous substances in a structure, typically in ponds and lagoons, to prevent the migration of contaminants into the environment.

Dewater: To remove water from wastes, soils, or chemicals.

Downgradient/Downslope: A downward hydrologic slope that causes ground water to move toward lower elevations. Therefore, wells downgradient of a contaminated ground water source are prone to receiving pollutants.

Engineering Control: Any mechanism to contain or stabilize contamination or ensure the effectiveness of a remedial action. Engineering controls may include, without limitation, caps, covers, dikes, trenches, leachate collection systems, signs, fences and access controls.

Ground Water Table: The level in the saturated zone at which the hydraulic pressure is equal to the atmospheric pressure. This level is best located by the use of piezometers or monitoring wells.

Impermeable: A layer of natural and/or man-made material of sufficient thickness, density and composition so as to have the maximum permeability for water of 10^{-7} cm/sec at the maximum anticipated hydrostatic pressure, not permitting fluids to pass through it (i.e., an impermeable cap).

Incineration: A treatment technology involving the burning of certain types of solid, liquid, or gaseous materials under controlled conditions to destroy or reduce the volume of hazardous waste.

In-situ: To leave in its original place.

Leachate: A contaminated liquid resulting when water percolates, or trickles, through waste materials and collects components of those wastes.

Levee: An embankment built alongside a river to prevent high water from flooding bordering land.

MCLs: An acronym for Maximum Contaminant Level. The maximum permissible level of a contaminant in water delivered to any user of a public water system.

Micrograms per kilogram (ug/kg); Milligrams per liter (mg/L): Units commonly used to express concentrations of contaminants.

Monitoring Wells: Special wells drilled at specific locations on or off a hazardous disposal site where ground water can be sampled at selected depths and studied to determine the direction of ground water flow and types and amounts of contaminants present.

NJGWQS: An acronym for New Jersey Ground Water Quality Standards N.J.A.C. 7:9-6 adopted January 7, 1993 which became effective February 1, 1993. These standards are used as regulatory requirements to govern and protect ground water quality in the State of New Jersey.

NOAA: An acronym for the National Oceanic Atmospheric Administration.

O & M: An acronym for operation and maintenance activities conducted at a site, after a Superfund action is completed, to ensure that the remedy is effective and operating properly.

Parts per billion (ppb); parts per million (ppm); Units commonly used to express concentrations of contaminants.

Receptor: Any human or other ecological component which is or may be affected by a contaminant from a contaminated site.

Remedial Investigation/ Feasibility Study (RI/FS): Investigation and analytical studies usually performed at the same time in an interactive, iterative process, and together referred to as the "RI/FS". They are intended to:

1) gather the data necessary to determine the type and extent of contamination at a Superfund site;

2) establish criteria for remediating the site;

3) identify and screen remediation alternatives for remedial action; and

4) analyze in detail the technology and costs of the alternatives.

Surface Water Quality Standards: State-adopted and EPA-approved ambient standards for surface water bodies. The standards cover the use of the water body and the water quality criteria that must be met to protect the designated use or users.

TCLP: An acronym used for the Toxicity Characteristic Leaching Procedure.

Terrestrial Wildlife: Those species which primarily use and inhabit "the land" (i.e. herbivores which grass on vegetated fields, carnivores which feed on herbivores and each other, and decomposers which feed on the dead plant and animal material and return nutrients to the soil for recycling).

Time to Implement: The amount of time it takes to obtain the necessary equipment, services, and materials to install, operate and maintain the selected remedial alternative. This includes all activities required to coordinate with federal, state and local regulatory agencies, and to obtain necessary approvals and/or permits.

Upgradient; Upslope: Upstream; an upward slope. Demarks areas that are higher than contaminated areas and, therefore, are not prone to contamination by the movement of polluted ground water.

Use Restriction: A form of institutional control in which a notice is filed with the office of the county recording officer, in the county in which the property

is located. Its intent is to inform prospective holders of an interest in the property that contamination exists on the property at a level that may statutorily restrict certain uses of or access to all or part of that property. It will also contain a delineation of those restrictions, a description of all specific engineering or institutional controls at the property that exist and that shall be maintained in order to prevent exposure to contaminants remaining on the property, and the written consent on the notice by the owner of the property. Use restrictions are filed as DECLARATION OF ENVIRONMENTAL RESTRICTIONS.

Volatile Organic Compounds (VOCs): VOCs are made as secondary petrochemicals. They include but are not limited to, light alcohols, acetone, trichloroethylene, perchloroethylene, dichloroethylene, benzene, vinyl chloride, toluene, and methylene chloride. These potentially toxic chemicals can be used as solvents, degreasers, paints, thinners, and fuels. Because of their volatile nature, they readily evaporate into the air, increasing the potential exposure to humans. Due to their low water solubility, environmental persistence, and wide spread industrial use, they are commonly found in soil and ground water.

Wetland: An area that is regularly saturated by surface or ground water and, under normal circumstances, capable of supporting vegetation typically adapted for life in saturated soil conditions. Wetlands are critical to sustaining many species of fish and wildlife. Wetlands generally include swamps, marshes, and bogs. Wetlands may be either coastal or inland. Coastal wetlands have salt or brackish (a mixture of salt and fresh) water, and most have tides, while inland wetlands are non-tidal and freshwater. Coastal wetlands are an integral component of estuaries.

RESPONSIVENESS SUMMARY

Responsiveness Summary for the Hercules, Inc.
Solid Waste Disposal Area Record of Decision

Overview

This is a summary of the public's questions and comments regarding the Proposed Plan for capping the Solid Waste Disposal Area at the Hercules, Inc. Superfund Site in Gibbstown, Gloucester County under Superfund guidelines, and the New Jersey Department of Environmental Protection's (Department) responses to those comments.

The public comment period extended from July 27, 1994 through August 25, 1994 and provided interested parties the opportunity to comment on the Proposed Plan for the Hercules, Inc. Superfund Site. On August 10, 1994 at 7:00 p.m., during the comment period, the Department held a public meeting at the Gibbstown Fire Hall to discuss the reports and the preferred remedy.

On the basis of the information contained in Remedial Investigation Reports, the Department recommended capping the Solid Waste Disposal Area (SWDA) with a flexible, impermeable cap, fencing the SWDA, and monitoring the ground water.

Background on Community Involvement and Concerns

The Hercules, Inc. Superfund Site is an active chemical production facility located adjacent to the Delaware River in Gibbstown, Gloucester County. The site came to the attention of the Department in 1981 when benzene was detected in the ground water at the plant. In 1982 the site was listed on the National Priorities (Superfund) List due to the benzene detected in the ground water beneath the production plant and also the presence of tar pits and solid waste in the part of the site known as the Solid Waste Disposal Area (SWDA). A formal Remedial Investigation of the ground water, surface water, sediments, soil and air at the production plant was initiated in 1986 and is ongoing. The SWDA was addressed separately from the remainder of the plant because it was determined to be unrelated to the other areas of environmental concern.

The SWDA of the Hercules site is located in a low lying swampy area next to the river which is isolated from the production plant. It covers approximately four acres and consists of two visible tar disposal areas, or "pits", and debris deposited between and immediately adjacent to the tar pits. The tars were a waste product generated by the production of aniline and were deposited at the SWDA prior to 1952 by the Du Pont Corporation, the previous owner of that portion of the Hercules site. Hercules obtained the property that comprises the SWDA from DuPont in 1952, and until 1974 used the area to dispose of solid waste materials from manufacturing processes and inert construction debris. Hercules stopped disposing of waste in the SWDA in 1974. From 1987 to 1993, Hercules conducted a Remedial Investigation of the SWDA. The results of the study and the Department's proposal to address the SWDA were the subject of a public meeting which was held in August 1994, which was attended by approximately 35 people.

Community involvement and interest in this site has historically been low. Representatives from Hercules periodically hold meetings with local officials on the general status of the site. The SWDA in particular has not elicited much interest from the local residents. This is most likely due to the location and low visibility of the SWDA, which is remote and difficult to reach, both by foot and by vehicle. Trespassing onto the SWDA has not been a significant problem, according to representatives from Hercules.

Summary of Comments Received During the Public Comment Period and Department Responses

Concerns raised during the Hercules, Inc. Superfund Site SWDA Public Meeting held on August 10, 1994 and during the comment period from July 27 to August 25, 1994 are summarized below. The comments are grouped in the following categories:

1. Protectiveness of the Preferred Remedy
2. Responsibility for SWDA
3. Cap Specifics/Impermeable Liner Requirement
4. Risk Assessment
5. General Statements

QUESTIONS AND COMMENTS

PROTECTIVENESS OF THE PREFERRED REMEDY

Question: How high will the fence around the SWDA be if the preferred remedy is implemented? What if a child climbs the fence and gets into the SWDA?

Response: The height of the fence will be determined during the design phase. The fence will be high enough to keep people out, and the fence and the area around it will be periodically inspected to ensure the SWDA remains secure. If someone were to breach the fence, the capping material would prevent direct contact with the buried waste.

Question: The map included with the Proposed Plan shows two levees at the SWDA, one on the river side and one on the southern side. Wouldn't the contaminated material be able to get out on the other three sides of the SWDA?

Response: There are earthen levees on the southern and the northwestern sides of the SWDA. The levees are earthen material and some solid waste material that have formed natural slopes. On the other sides of the SWDA where there are no levees, the tar material, which has been in place since the 1950s through the 1970s, has reached a point of equilibrium. It will not move any farther than it already has moved at this time. In fact, the tar material has been in its current configuration since the 1970s, based on a review of all the aerial photographs and the Department's observations of the site. Furthermore, it must be emphasized that upon completion of the remedial actions all of the tar materials and other solid waste will be contained within a cap or cover.

Question: If the river wall broke and the area flooded, wouldn't the material at the SWDA become dispersed throughout the town?

Response: The cap will be designed to protect against a 100-year storm event. However, if the cap does fail, the tar would not mix with water and it would be unlikely that the tar would move due to its shape and size.

Question: Will the SWDA have a lid put on it?

Response: The preferred remedy to cap the area essentially amounts to the placement of a lid over the waste.

Question: Will water be able to penetrate the cap?

Response: The cap would include an impermeable liner to prohibit infiltration of water through the buried waste.

Question: A liner was put in the ground out west that was guaranteed to last a hundred years and within the first year it broke. Could this happen with the proposed cap?

Response: Hercules will be required to conduct periodic inspections and to maintain the cap to ensure its continued effectiveness. Should the cap break, Hercules will be required to conduct any necessary repairs. However, it is unlikely the cap will break.

Question: What if the SWDA caught fire?

Response: The preferred remedy when completed would consist of a flexible impermeable cap covering the tar and solid waste material, which would be covered by a layer of clean, vegetated soil and enclosed with a fence. There is no reason to believe that the SWDA would catch fire.

Question: If the ground over the SWDA is vegetated as part of the capping, wouldn't contaminants be drawn up through the vegetation, and then be consumed by wildlife?

Response: No. Under the preferred remedy, an impermeable cap will be placed over the tars and solid waste material. Clean soil will then be introduced on top of the impermeable liner, and the area vegetated. The contaminated material will not be in contact the clean soil.

Question: The Proposed Plan states that the preferred remedy would provide a high level of protection of human health and the environment. What is the definition of "a high level of protection"?

Response: A remedy that provides a high level of protection is one that would meet the one-in-a-million cancer risk standard, and has a Hazard Index of less than 1.0 for non-carcinogenic (non-cancer) health effects. A remedy that meets this level of protectiveness would not result in more than one additional cancer per one million people exposed to the remediated site over a 70 year period (a typical lifetime), and would not present a risk for non-cancerous health effects in humans.

Question: Will the SWDA part of the Hercules site be taken off the Superfund list after the five year review period? What kind of monitoring will take place after the five year period is over?

Response: As long as there are contaminants in place, the site will stay on the Superfund list and the effectiveness of the remedy will be reviewed every five years. Ground water at the SWDA will be monitored for 30 years.

Question: Why was capping of the SWDA chosen as the preferred remedy if the incineration alternative, while initially more expensive, may turn out to be the cheaper alternative in the long term if problems were to develop with the cap?

Response: The cost estimates provided in the Proposed Plan are the costs for implementing the remedies and monitoring the SWDA over a thirty year time period. Whether or not the incineration remedy would prove to be more expensive than the capping remedy over the long term cannot be determined with absolute certainty. However, the Department is responsible for providing a high level of protectiveness while at the same time following the state federal laws which require that factors such as the cost, permanence, and the long effectiveness versus the short-term impacts of the remedies be considered. The community's acceptance of a remedy is also a consideration, and it is unlikely that the community would accept an incinerator in the town. The Department believes that the capping of the SWDA provides the best balance of these factors of all the remedial options.

Question: If after 30 years there appears to be no spread of the contamination, will the SWDA portion of the Hercules site be taken off of the Superfund list?

Response: As long as contamination remains at the SWDA, which it will under the capping remedy, then the site will remain on the Superfund list.

Question: What is the difference between completion of a 30 year monitoring plan and the removal of a site from the Superfund List?

Response: The ground water at the SWDA will be sampled for at least 30 years under the preferred remedy. After that, more ground water sampling may or may not be done, based upon the results of that sampling. However, the institutional controls imposed under the preferred remedy in the form of environmental use restrictions or deed notices would require that the remedy be maintained and the SWDA secured beyond that 30 year period. As stated previously, the site will remain on the Superfund List as long as there are contaminants remaining on the site.

Question: How often would ground water be sampled under the 30 year monitoring plan? What criteria will be used to evaluate the sampling results?

Response: While the specific sampling frequency has not been determined, it is anticipated that the ground water will be sampled on at least an annual basis. The ground water sampling results will be compared to the New Jersey Ground Water Quality Standards. The sampling results, including ground water flow direction, will be evaluated to determine the effectiveness of the capping remedy and protection of potential receptors.

Question: Is any ground water monitoring done outside the Hercules plant within the town?

Response: There are ground water monitoring wells outside the Hercules property that Hercules samples regularly and submits the data to the Department. Additionally, Gibbstown's water is sampled regularly pursuant to the New Jersey Safe Drinking Water Act, which requires all public community water systems to be tested periodically for hazardous constituents.

Question: The Proposed Plan states that the In-Place Containment (capping) is a non-permanent remedy with a cost of $2.0 million and that the Incineration with Off-Site Disposal is the only permanent remedy and has a cost of $36 million. It goes on to state that the cost differential between these two alternatives is greater than 50 percent of the non-permanent remedy, and therefore the In-Place Containment is the option of choice. Does this mean that cost was the determining factor? Should cost be the determining factor if were are seeking a permanent resolution to this problem?

Response: Under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), remedial alternatives for a Superfund site must be evaluated for several criteria. The first and most important consideration is whether a remedial alternative is protective of human health, safety and the environment. If two or more remedial alternatives are determined to meet the protectiveness requirement, then the alternatives must be weighed against each other based upon the following eight criteria: 1) compliance with other statutory laws; 2) long-term effectiveness and permanence; 3) reduction of toxicity, mobility or volume through treatment; 4) short-term effectiveness; 5) implementability; 6) cost; 7) acceptance by the United States Environmental Protection Agency (USEPA); and 8) acceptance by the community.

Analysis of the In-Place Containment (capping) remedy and the Incineration remedy indicated that both alternatives were protective of human health and the environment. The In-Place Containment remedy, however, was determined to represent the best overall balance of the eight remaining criteria under CERCLA.

Comment: The Proposed Plan states that the SWDA could not be cost-effectively excavated due to its large size. However, BROS Landfill in Logan Township, three miles from Gibbstown, is a much larger site that is being permanently cleaned up through excavation and other methods. This discrepancy disturbs me.

Response: The cost-effectiveness of a permanent remedy at a site is an evaluation that is made relative to the hazards that the site presents. There is considerable difference between the Hercules SWDA and the BROS Landfill. High levels of polychlorinated biphenyls (PCBs) were detected at the BROS site, and the cancer risk based upon exposure to the PCBs was much more severe than the cancer risk that was determined based on the Risk Assessment for the SWDA at the Hercules site. In addition, the contamination at BROS was determined to be likely to migrate from the site, as opposed to the Hercules SWDA in which the contamination is relatively immobile. Finally, the ground water and the wetlands at the BROS site were found to be much more highly contaminated than at the SWDA. In all, the magnitude of the contamination at the SWDA was fairly low, and this was a factor which contributed to the recommendation of the nonpermanent remedy of In-Place Containment (capping).

Question: How many ground water monitor wells have been installed at the SWDA since 1985? Why were these additional wells installed? Are there plans to install additional ground water monitoring wells?

Response: Six additional ground water monitoring wells were installed since 1985, for a total of 11 monitoring wells surrounding the SWDA. The additional wells were installed to evaluate the area of ground water contamination and to determine the ground water flow direction. At this time there are no plans to install additional ground water monitoring wells, however wells may be added in the future if sampling data indicates they are needed.

Question: What safety precautions will be arranged if the Department proceeds with Alternative 3 (In-Place Containment) or Alternative 4 (Incineration and Off-Site Disposal) as far as warnings to notify the Township or the residents if something goes wrong?

Response: During the construction of the In-Place Containment remedy, Hercules' contractor will be required to have approved site safety plans which would specify measures, including notification of officials, to be taken in the event that an emergency arises. Once the In-Place Containment Remedy has been completed, it is unlikely that anything will go wrong because it is a proven remediation technology. Any unexpected changes in soil or ground water quality would be detected by the required periodic inspections of the cap and sampling of the monitoring wells. In the event of any imminent hazard, Hercules and/or the Department would immediately notify the local officials, who would contact the local residents.

Question: Would the local officials be able to respond quickly if something were to occur of catastrophic nature?

Response: Based on the Department's studies there is nothing in the SWDA that would leave the site or migrate from the site rapidly. There are no gases being generated at the SWDA. Once the solid material is capped or contained, the only place that contamination may potentially go would be into the ground water. Any change to the ground water would be detected by the Department during the routine sampling of the monitoring wells surrounding the contained waste, which will effectively prevent any threat to the community.

Question: Has the tar moved within the last 30 years?

Response: The tar has moved a little bit since it was placed at the SWDA. The movement of the tar is due to the fact that the tar has different physical property depending on the temperature. It has a hard, glassy surface in the winter and in the summer it is soft. With the change in temperatures over the seasons from the time that the tar was placed there, it has moved a little. Since there hasn't been any more material placed there recently, the tar will not move any further.

Question: As shown in Figure 1 (Location map), floodgates are situated on Clonmell Creek and adjacent to the SWDA. Has the Department or Hercules, Inc. determined the physical conditions of improvements needed for these structures, and their ability to protect the plant and surrounding area from flooding? Also, is the SWDA cap capable of withstanding a major flooding event?

Response: The conditions of the floodgates and the ability of the cap to withstand flooding events will be addressed during the design of the SWDA cap. The existing levee along the Delaware River provides some protection against flooding of the SWDA. In addition, storm water management controls will be a primary component of the final engineered cap system.

Question: The report mentions a ten foot high fence constructed by the Army Corp of Engineers to separate the Hercules property from the Delaware River. Does the ACOE schedule regular inspections to determine the levee's structural integrity and its ability to protect the area from flooding?

Response: The ACOE did not construct the Delaware River levee and does not conduct inspections. Hercules will maintain responsibility for portion of the levee which abuts their prpoerty.

RESPONSIBILITY FOR THE SOLID WASTE DISPOSAL AREA

Question: If someone gets into the SWDA, who's responsible?

Response: Hercules is responsible for the SWDA, and will retain responsibility for it as long as contamination remains there.

Question: Who is responsible for the SWDA after the five year review period has elapsed?

Response: The five year review evaluates the protectiveness of the capping remedy. If the Department determines that the capping remedy is not protective of the environment, Hercules will be required to take additional action to ensure protectiveness. Hercules will retain responsibility for the SWDA as long as contamination remains there.

Question: What would happen if Hercules, Inc. were to sell the property before the thirty year ground water monitoring period is over? Will the buyer of the property have to continue monitoring the ground water?

Response: The preferred remedy includes a requirement for institutional controls at the SWDA. The institutional controls would be in the form of a "Declaration of Environmental Restrictions" (DER), which is a notice in the deed file. The DER would require a potential purchaser of the property to maintain the conditions at the SWDA, including the 30 year ground water monitoring program. Hercules, Inc. would retain liability for the contamination, however, in the event that the property were sold.

Question: Who would take over responsibility and liability for the SWDA in the event that Hercules were to go bankrupt, and go out of business? Who would pay the cost for maintaining and monitoring the site?

Response: The Department and the United States Environmental Protection Agency would share responsibility and liability for the site if Hercules were to go bankrupt. Public funds would pay for the cost of maintaining and monitoring the site.

Question: Did Hercules purchase the property knowing that it was contaminated?

Response: Based on the Department's discussions with plant employees familiar with the historical operations, Hercules was probably aware that solid waste materials were placed in the area now known as the SWDA prior to their purchase of the property in 1952. However, the material was most likely not considered "contaminated" at that time.

Question: Is the Administrative Consent Order for the Hercules site still in effect? If so, when will it expire?

Response: The Administrative Consent Order is in effect, and will continue to be in effect until the investigation of the main plant is completed.

Question: Is the $2 million letter of credit still in effect, or has it been reduced?

Response: The $2 million letter of credit is still in effect, though Hercules may change its form if it so chooses.

Question: If Hercules wanted to reduce the letter of credit to a smaller amount, would the Department have to agree to that reduction first?

Response: Yes. The letter of credit must at least cover the cost of the cleanup, so in fact the Department could increase it if it was determined that more money is needed to complete the cleanup.

CAP SPECIFICS/IMPERMEABLE LINER REQUIREMENT

Comment: Hercules agrees that containment of waste materials, collection and recycling of lead fragments, ground water monitoring, institutional controls, and designation of a Classification Exception Area for ground water underneath and surrounding the SWDA. Hercules, Inc. also concurs with the finding stated in the Proposed Plan that the most serious risk from the SWDA is direct exposure of hazardous substances to a transient population of wildlife and the occasional plant employee or trespasser. Based on this finding Hercules, Inc. agrees that a cover system is needed to prevent direct contact with the tar and miscellaneous solid waste debris.

DuPont, an adjacent property owner, supports the general concept of containment in place for the SWDA. With the cover in place, no risk will be present because direct exposure to the waste is eliminated. In addition, the ground water does not present an unacceptable risk. Excavation, treatment, and off-site disposal (Alternative 4) are unnecessarily costly in light of the equally protective yet more feasible solution of containing the waste on-site. Containment eliminates the short term risk created by implementation of Alternative 4.

The Hercules Gibbstown SWDA has been under investigation for many years. Clearly, the SWDA should be closed (with a soil cover or other type of cap) as would be required of any SWDA. Although DuPont has concerns about the methodologies and assumptions used in the risk assessment and believes that it significantly overstates the risk, once covered the SWDA will pose no significant risk to human health and the environment. Rather than continuing to study the SWDA, DuPont supports the Department's plan to move forward and implement the in-place containment remedial action.

Response: The Department agrees that in-place containment provides the best balance of a cost-effective remedy that reduces both short-term and long-term exposures to the wastes.

Comment: Hercules, Inc. disagrees with the need to eliminate the exposure of solid waste to precipitation events, as stated on page 8 of the Proposed Plan. During the course of the Remedial Investigation, Risk Assessment and Feasibility

Study, it was never determined that leaching of the solid waste was a migration pathway requiring remediation. The data collected at the SWDA has not demonstrated a need to eliminate or prevent infiltration of the solid waste. Infiltration of precipitation through the solid waste/tar has not been identified as an exposure pathway requiring remediation. The solid waste/tar has been in place since the late 1950s and there has been no long term degradation of ground water quality. Restricting infiltration will not improve the present or future ground water quality. Since there presently is no requirement to mitigate the infiltration pathway (because there is no associated risk), Hercules, Inc. believes the requirement for an impermeable cap is not technically justifiable.

The proposed "impermeable" cap required in the Proposed Plan is a rigid regulatory requirement, that is not necessary given the Remedial Action Objectives to mitigate the direct contact with the tar material, and miscellaneous solid waste. The in-place containment system is focused on reducing the direct contact pathway. To meet this requirement the capping system in the Feasibility Study was focused on strength and long-term integrity. Regarding the need to "eliminate the exposure of the solid waste to precipitation events", the promotion of surface water runoff is part of any capping system, due to surface drainage requirements for an engineered capping system.

In general, regrading and recontouring the surface of an area will promote positive surface water flow, and significantly reduce infiltration of precipitation. The reinforced soil cap proposed in the Feasibility Study will require regrading and recontouring of the land surface now encompassing the SWDA. Upon completion of the new capping system, new vegetative cover will promote evapotranspiration of non-runoff water, providing additional reduction of water available to infiltrate the cap system. In addition, the materials used to construct the reinforced soil cap, along with the proposed regraded slope and vegetative cover, will further limit the amount of infiltration of precipitation and promote runoff.

The Department's technical committee comments on the Feasibility Study indicated that the reinforced soil capping system construction materials are best determined in the Remedial Design Phase. By restricting the cap to include an impermeable component, Hercules believes that the Proposed Plan is inconsistent with the Feasibility Study, and the technical committee's recommendations and requirements. The Proposed Plan does not provide the flexibility required to create the most technically sound, cost-effective engineered cap system which meets the requirements of the technical committee.

In summary, an impermeable cap does not increase the reduction in risk as compared to a reinforced soil cap. A reinforced soil cap will mitigate the direct contact exposure pathway, prevent migration via surface runoff, and engineered properly it will also promote surface water runoff. Hercules, Inc. therefore requests that the Department provide technical justification for an impermeable liner component for the containment remedy in the Proposed Plan.

Comment: The Proposed Plan does not clearly provide the basis for requiring an impermeable cap. The Remedial Investigation and Feasibility Study (RI/FS) show, as stated on page 3 of the Proposed Plan, that "the tar constituents are essentially insoluble, and the tar is relatively impermeable. This limits the leaching capacity of the tar." Based on the study conclusions and the lack of an impact on ground water from the tar, it is DuPont's opinion that an impermeable cap is not necessary.

The Feasibility Study recommended containment in place (Alternative 3), consisting of a vegetated soil cover with a geosynthetic reinforcement layer. However, on page 6 of the Proposed Plan, under description of Alternative 3, and impermeable liner cap is specified at an additional estimated cost of approximately $300,000.

Later in the document (page 8 under Alternative 3 discussion), the Department appears to be concerned with the potential for future leaching of the solid waste materials overlying the tar. Based on Du Pont's review of the data, the low-level constituent concentrations detected in the ground water appear to be related to the solid waste materials. For example, the highest concentrations in the ground water are the compounds cumene and toluene, which were found to be related to the solid waste.

It is Du Pont's understanding that the rationale for the impermeable cap is to prevent surface infiltration from causing leaching of the solid waste. The Record of Decision should clearly reflect the basis for specifying an impermeable cap to justify the additional expense as the current rational is not explicit. Further, Du Pont supports the Feasibility Study recommendation that a reinforced cover is an appropriate remedy.

Response: The Department believes it is justified in requiring an impermeable liner as a component of the reinforced soil cap. The requirement for an impermeable cap is based on the results of the Risk Assessment, and while direct contact with the tars at the SWDA was identified as the primary risk in the Risk Assessment, extensive investigations of the area identified other characteristics of the SWDA that must be addressed by this action.

The impermeable cap is being required to prevent leachate generation from the various solid wastes mixed with the tar. Additionally, the impermeable cap is considered relevant and appropriate for the SWDA since the aniline still bottom tars are a listed hazardous waste and this action is essentially a closure of a landfill known to contain a large quantity of hazardous waste. While the Department recognizes and emphasizes that the tars are "largely insoluble" and thus leaching will be "limited", the fact remains that the tar does slowly leach contaminants to the surrounding environment. The tar samples did leach benzidine in a TCLP (Toxicity Characteristic Leaching Procedure) test performed in 1988. In addition, several constituents (i.e., lead, chromium, semi-volatile compounds, tentatively identified compounds, etc.) found in the tar sample analysis were also found in the ground water, underlying soils, and surrounding surface waters. Some of these constituents were detected at concentrations exceeding ground water standards on multiple occasions. Based on the concentrations of lead detected in the analysis of the tar, the Department cannot be certain that the levels of lead detected in the ground water can be attributed only to the presence of lead fragments found in the area. During the excavation of test pits through the buried tars and solid wastes, a variety of materials were found above the water table that could potentially leach contaminants. The materials found included drums, black ashy material, soft tars and black oily materials (possibly tar sludges). These findings suggest the possibility that the tars are present in varying states and degrees of solubility below the surface. Furthermore, during implementation of the remedial action, there will be increased heavy equipment traffic on the waste area, various areas will be excavated, graded and consolidated and the cap materials will increase the load on the waste materials. All of these factors may increase the mobility of those more fluid components of waste identified in the area. The Department believes that the impermeable cap will provide better containment of these more fluid tars or tar derivatives and thus slightly increase the reduction in exposure risk as compared to the reinforced soil cap.

In summary, the Department agrees that the primary remedial action objective with respect to human health is to eliminate the direct contact exposure hazard by means of an engineered cover system. Other objectives of the remedial action include eliminating exposure to other solid wastes mixed with the tars and tar derivatives and minimizing migration of contaminants from the tar and other solid waste mixed with the tar and tar derivatives to the surrounding environment. With the site conditions as summarized above, and considering the remedy does not include any active ground water remediation, the Department believes that a properly engineered cover system that includes an impermeable, flexible membrane

liner will maximize protection of human health and the environment by providing better containment at the SWDA in a cost effective manner.

Comment: Hercules believes that the Proposed Plan does not provide the flexibility required to create the most technically sound, cost-effective, engineered cap system which meets the requirements of the technical committee.

The Proposed Plan should be less specific in the cap design to allow for modification during the design phase. Additional geotechnical consideration is needed to determine the structural design of the cap considering the nature of the underlying waste. During the design, it may be determined that the specific cap details outlined in the Proposed Plan may not be the most appropriate cap for the SWDA.

Comment: Du Pont suggests that the words "or the equivalent" be added at the end of the sentence on page 6, left hand column, under the Alternative 3 discussion: "The impermeable cap would consist of a multi-layer system consisting of an upper vegetative layer underlain by approximately 2 feet of clean fill, an impermeable synthetic membrane liner, and a protective sub-layer for the liner, or the equivalent." This wording would allow flexibility for minor design modifications to ensure the integrity of the cap system.

Response: The Department agrees that it is appropriate to select the specific capping materials during the design phase, and then to determine the necessary thicknesses of each material layer based on the material type selected. However, this recommendation made by the Department during the Feasibility Study is in no way inconsistent with the Proposed Plan requirement that the final engineered cap include an impermeable barrier layer. The impermeable layer is a design criteria, while the actual construction material used to create this barrier will be determined during the design phase. Notwithstanding, the Department supports Du Pont's recommendation to add the phrase "or the equivalent", as approved by the Department, to the description of the multi-layer capping system to be installed.

Comment: Page 7, under Alternative 3, states that the impermeable cap will "provide a sufficient level of containment for the tar." The meaning of this sentence is unclear because the tar has been shown not to leach into underlying ground water. If the Department maintains that an impermeable cap is necessary, a sentence should be added here that the impermeable cap will help prevent further ground water degradation from the potential leaching of hazardous constituents from the solid waste.

Response: The Department agrees with this recommendation, and will modify this sentence in the Record of Decision to state that the impermeable liner will help prevent ground water degradation from the potential leaching of hazardous constituents from the solid waste material, and help to prevent exposure hazards due to the potential for the soft tars to eventually breach the soil cover.

RISK ASSESSMENT

Question: Was there a Risk Assessment conducted to evaluate the effect of the SWDA on the community, and if so, what were the results of that Risk Assessment?

Response: A Risk Assessment was not done to evaluate the effects of the SWDA on the community, since it is not deemed to be a risk to the general population of Gibbstown. The Risk Assessment that was conducted as part of the Remedial Investigation evaluated the potential effects of the SWDA on people that may come in direct contact with it, such as plant employees and trespassers.

Question: What were the findings of the Risk Assessment regarding the potential effects to people that come in contact with the SWDA?

Response: The Risk Assessment indicated that the primary risk of the SWDA was potential carcinogenic effects due to direct contact with the tar. The risk for carcinogenic effects was estimated to be eight additional cancers for every one thousand people directly exposed by contact with the tar on a daily basis over a 70 year period (a typical lifetime).

Question: What about the people that spent a lot of time at the site between 1952 and 1970? A lot of people who are adults now used to ride their bikes and built forts in that area as children. Are there any concerns about the effect of the site on these people?

Response: No contaminants were found at the SWDA that were determined to be acutely toxic or hazardous over a short term of exposure. As stated previously, the tar material was determined to be the most hazardous component of the site. However, the hazard presented by the tar would result only from chronic or long term exposure, or exposure over much longer periods of time than those experienced by children who may have played at the site in the past.

Comment: Although we (Du Pont) do not agree with the way the risk assessment was conducted, nor its conclusions, it is important to clarify that the risk discussed on page 4 is from direct exposure. Once covered, the pathway would be eliminated, and no potential risk would be present. On page 4, right-hand column, first sentence, the word "direct" should be added: "The most probable and maximum carcinogenic risk is associated with direct exposure to tar and tar soil."

Response: The Department concurs with this recommendation to modify the wording, and accordingly, the above sentence will be modified to state that the most probable and maximum carcinogenic risk is associated with direct exposure to tar and soil.

Comment: Du Pont has concerns about the methodologies and assumptions used in the risk assessment and believes it significantly overstates the risk. However, it is clear that, once covered, the SWDA will pose no significant risk to human health and the environment. Page 4 of the Proposed Plan discusses the risk assessment. The calculated risk is driven by benzidine and carbazole, which were not even detected in the tar. The major constituents actually detected in the tar were not determined to present significant risk.

Du Pont does not believe that benzidine is a major contributor to risk because it was never detected in the tar or in the soil. However, benzidine was detected in one Toxicity Characteristic Leaching Procedure (TCLP) result for the tar. The value used in the calculation was derived when the consultant back-calculated an estimated concentration in the tar using the TCLP data and densities of water and benzidine. This approach is technically flawed and does not conform with standard Environmental Protection Agency (EPA) guidance.

Du Pont does not believe that carbazole is a major contributor to risk because it was detected as a tentatively identified compound (TIC) in the tar, but not in the soil or ground water beneath the tar. Because carbazole was detected as a TIC, its actual identity and concentration are highly uncertain.

The limited data discussed above was incorrectly applied to a surface soil exposure scenario. The assumption that tar should be evaluated in the same manner as soil is technically flawed in that the tar does not dust and does not behave similar to soil. The assumption that tar adheres to 20 percent of the body surface, as soil does, is overly conservative.

The additive effect of these flawed assumptions results in the assessment that dramatically overstates the risks associated with the tar.

Response: The Department does not agree that the risk assessment is flawed. The risk assessment follows accepted methodologies employed by the state and federal government.

Comment: On page 7, under the overall protection of human health and the environment evaluation of Alternative 2, the last sentence of the left-side column should be removed: "For all media except the tar, this alternative would adequately satisfy the remedial action objectives in terms of potential risk to human health." Based on the above comments, the risks associated with the tar are exaggerated. This statement also contradicts the Department's own assessment of risk, which states that direct exposure is the only significant risk (see page 4) With restricted access to the area, the potential for direct exposure to human health is eliminated.

Response: As stated in the responses above, the Department does not believe that the risks associated with the tar are exaggerated. While direct contact with the tar is the primary risk, elimination of that risk is not the only objective of the remedial action. Other concerns include exposure and migration of other wastes mixed with the tars and tar derivatives.

GENERAL STATEMENTS

Comment: I'm a local resident and also a former employee of Hercules. I'm sure the Department and Hercules have done a lot of study on this and I'm thankful that it can be capped and that we don't have to go into any incineration. I think incineration would really aggravate the people around here and cause a lot more problems for us. But if you continue to study this and follow through with everything, I'm sure everything will be well.

Comment: I think that incineration would be a poor solution particularly because our highly industrialized area here receives more than its share of pollution right now. I also believe that Hercules is in good faith trying to solve the problem. It would seem to me that the solution of incineration would be out of the question, particularly on-site. If you want to take it to somebody else's back yard, all right, but not here. And I would say that really capping it would probably be the best answer, particularly if you're monitoring to make sure that our ground water is not becoming more contaminated. That's very important. I would say that this is the only way you can go. So I believe that as long as you are covering this and I know that Hercules in good faith is trying to do their best, I think that we should take the most expedient method that would protect our residents. I also sympathize with people that have talked about the possibility of children getting into the area and I think that should be avoided as much as possible.

Comment: At the public meeting held on August 10, 1994 the mayor of Gibbstown, Raymond Williams made a statement to the audience. In the statement, the mayor emphasized the following points:

a. Hercules, Inc. has a positive and cooperative relationship with the township, and over the years has participated in a number of emergency drills with township officials.

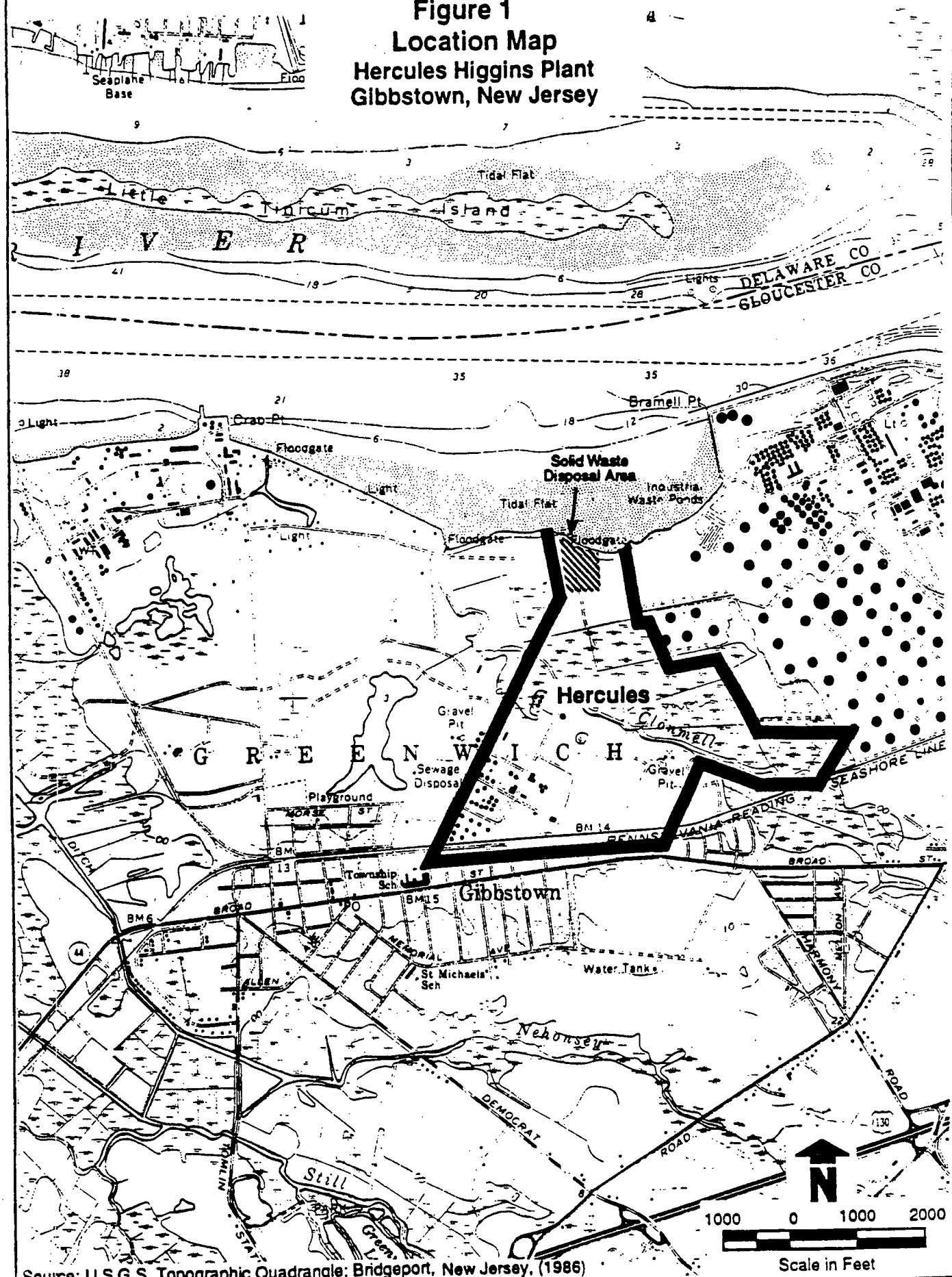
b. The incineration alternative (Alternative 4) would probably not be well received by the citizens if it were selected as the final alternative.

c. The township officials are very concerned about the quality of the drinking water, and consider the monitoring of the ground water at the SWDA to be an important part of the remedial process.

d. At the public meeting held on August 10, 1994, a member of the audience requested that the most up-to date site maps available be used in future

handouts. The Department indicated that the map used in the handout provided for the meeting gave an accurate representation of the SWDA conditions.

Figure 1
Location Map
Hercules Higgins Plant
Gibbstown, New Jersey



Source: U.S.G.S. Topographic Quadrangle; Bridgeport, New Jersey, (1986)

1766A03/EJK/5.28.93/Rev 8.4.93

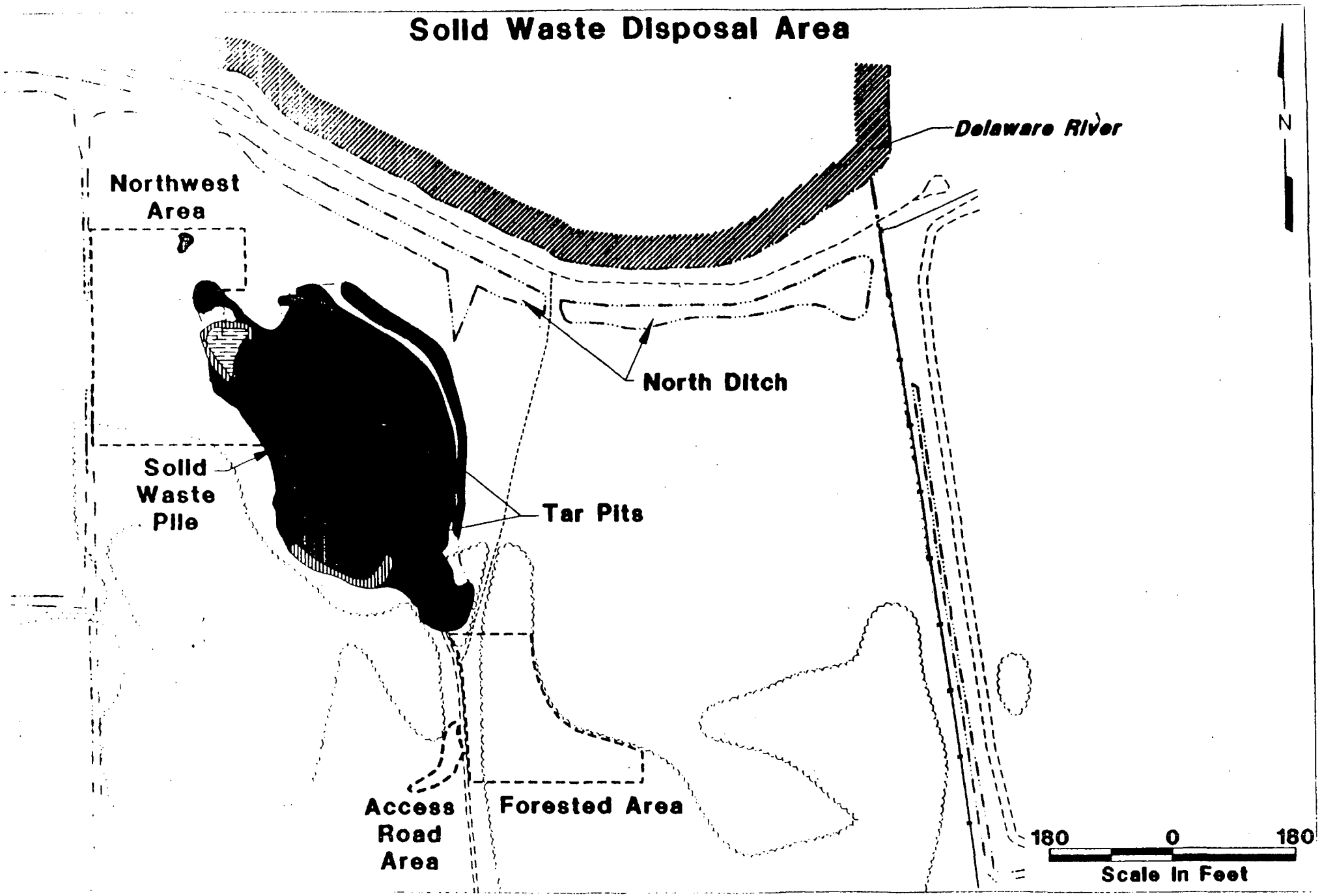
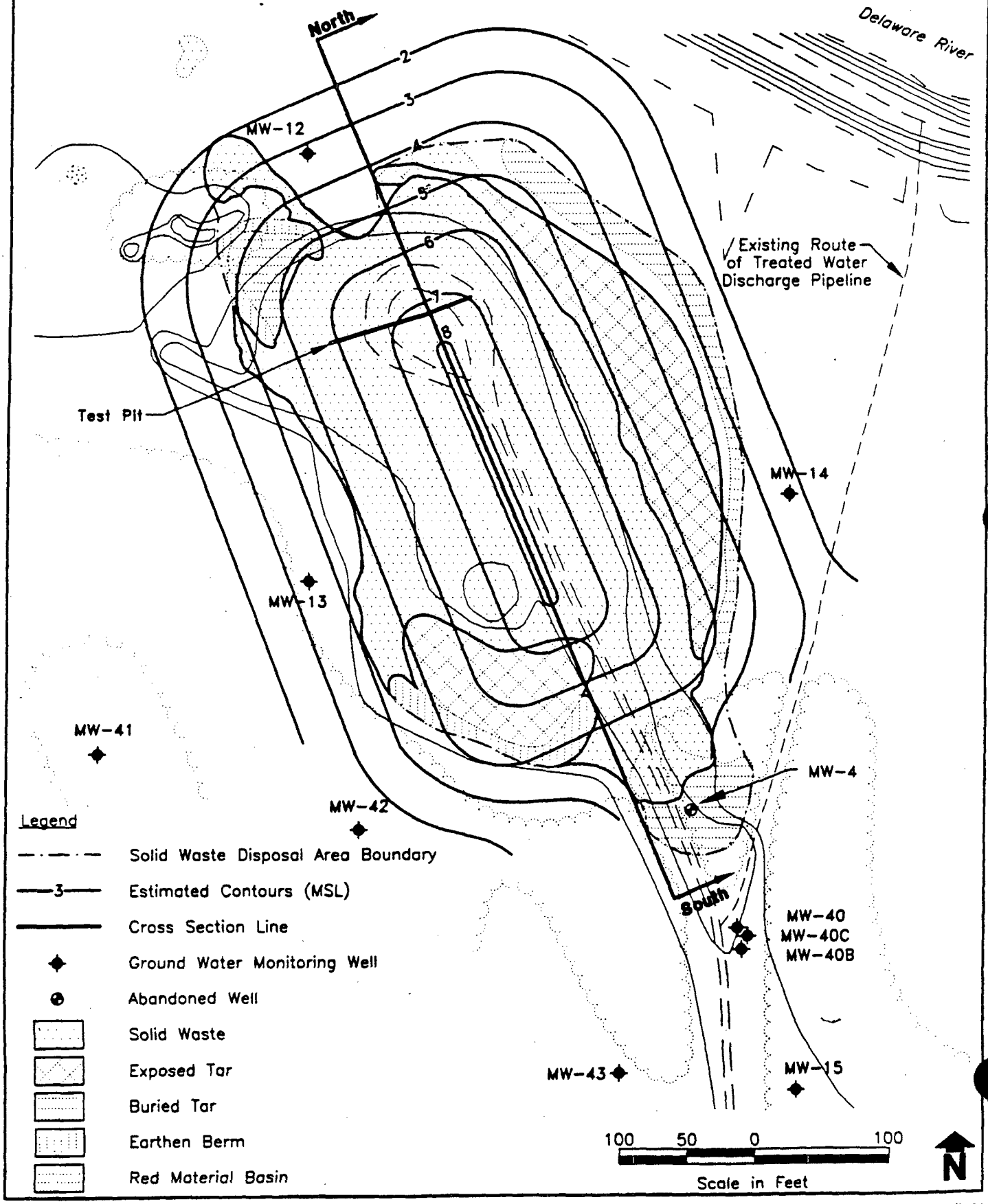
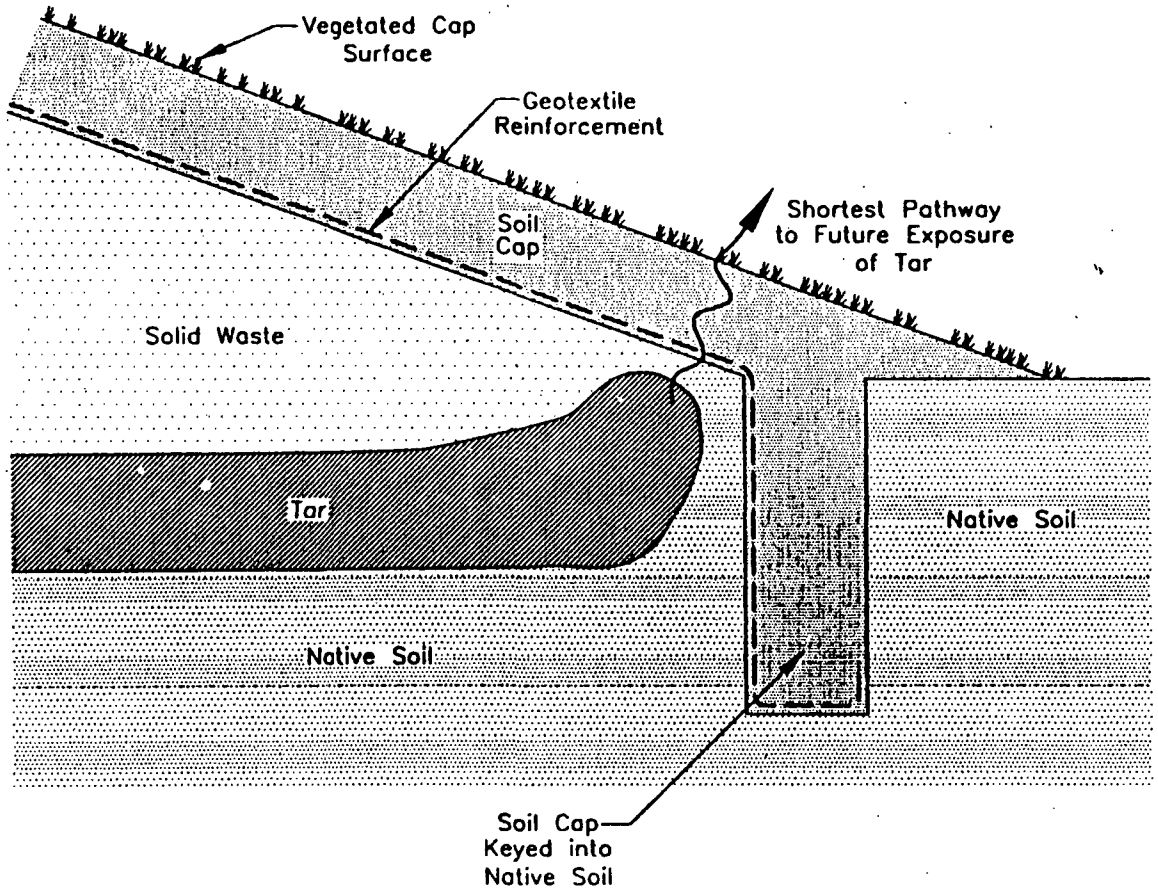

Solid Waste Disposal Area
Delaware River
N
Northwest Area
North Ditch
Solid Waste Pile
Tar Pits
Access Road Area
Forested Area
180 0 180
Scale In Feet

Figure 4
Conceptual Plan of Engineered Soil Cap on SWDA
Hercules-Higgins Plant



1766A.03.01/05.21.93-MKB/05.24.93-CMP/1101

Figure 5
Schematic Edge Detail of Engineered Cap
Hercules-Higgins Plant



Schematic, Not to Scale

1766A.03.01/05.20.93-MKB/05.27.93-DST/E201

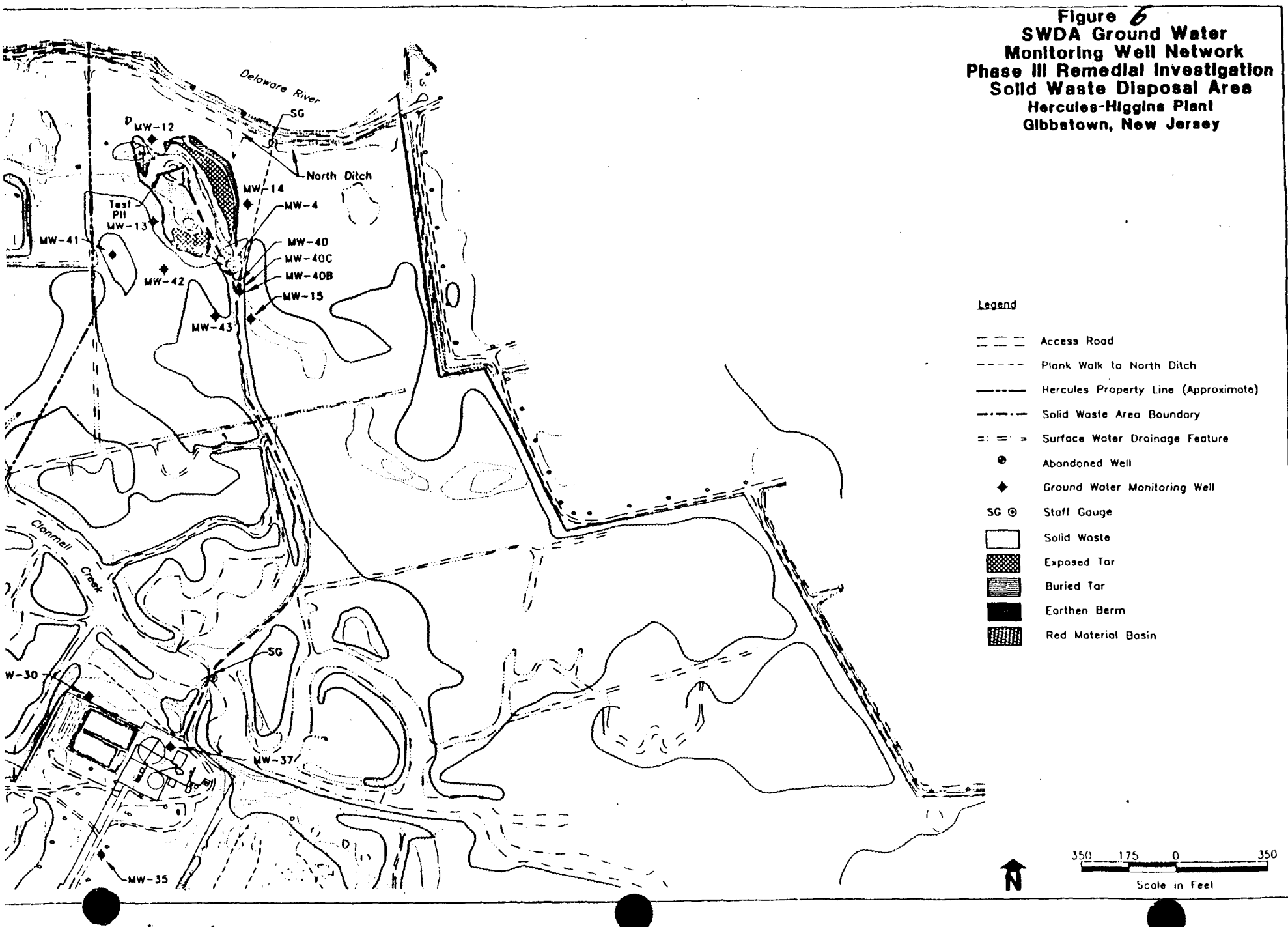


Figure 6
SWDA Ground Water
Monitoring Well Network
Phase III Remedial Investigation
Solid Waste Disposal Area
Hercules-Higgins Plant
Gibbstown, New Jersey
Delaware River
SG
MW-12
North Ditch
MW-14
MW-4
Test Pit MW-13
MW-41
MW-40
MW-40C
MW-40B
MW-42
MW-15
MW-43
Clonmell Creek
SG
W-30
MW-37
MW-35
Legend
Access Road
Plank Walk to North Ditch
Hercules Property Line (Approximate)
Solid Waste Area Boundary
Surface Water Drainage Feature
Abandoned Well
Ground Water Monitoring Well
SG Staff Gauge
Solid Waste
Exposed Tar
Buried Tar
Earthen Berm
Red Material Basin
N
350 175 0 350
Scale in Feet

Table 1
Administrative Record Index
Hercules Incorporated - SWDA

- Administrative Consent Order entered into between Hercules and NJDEP; Paragraph 34 requires Investigation of SWDA (July 1986)
- Phase I Work Plan (September 1986)
- Results of Phase I Investigation of SWDA (March 1988)
- Addendum to Results of Phase I Investigation (September 1988)
- Phase II Investigation Scope of Work (September 1988)
- Phase II Supplemental Investigation Scope of Work (February 1989)
- Phase II Remedial Investigation Results, SWDA (June 1989)
- Phase II Addendum, Hercules Plant (June 1990)
- Phase III Remedial Investigation Work Plan and Quality Assurance Project Plan, QAPP (April 1992)
- Response to Comments on Phase II Remedial Investigation Work Plan (June 1992)
- Revised QAPP for SWDA Remedial Investigation (June 1992)
- Revised Table 4-1 of the QAPP (July 1992)
- Analytical Method for Differentiation of Diphenylamine/Nitrosodiphenylamine in QAPP (August 1992)
- Phase III Remedial Investigation, SWDA (February 1993)
- NJDEP Approval of Remedial Investigation Activities (May 1993)
- Final Revised Feasibility Study (October 1993)
- Revised Risk Assessment (December 1993)
- Public Meeting to Present Proposed Plan for SWDA (August 1994)
- USEPA Correspondence to NJDEP Regarding Selected Remedial Alternative (June 1995)
- NJDEP Correspondence to USEPA Regarding Decision to Modify Selected Remedial Alternative (August 1995)

Table 2
TBCs-New Jersey Soil Cleanup Criteria (ppm)
Hercules Incorporated - SWDA

	Residential Direct Contact Soil Cleanup Criteria	Non-Residential Direct Contact Soil Cleanup Criteria	Impact to Ground Water Soil Cleanup Criteria
Volatile Organics			
Acetone	1000	1000	100
Acrylonitrile	1	5	1
Benzene	3	13	1
Bromodichloromethane	11	46	1
Bromoform	86	370	1
Bromomethane	79	1000	1
2-Butanone (MEK)	1000	1000	50
Carbon tetrachloride	2	4	1
Chlorobenzene	37	680	1
Chloroform	19	28	1
Chloromethane	520	1000	10
Dibromochloromethane	110	1000	1
1,1-Dichloroethane	570	1000	10
1,2-Dichloroethane	6	24	1
1,1-Dichloroethene	8	150	10
1,2-Dichloroethene (trans)	1000	1000	50
1,2-Dichloroethene (cis)	79	1000	1
1,2-Dichloropropane	10	43	
Ethylbenzene	1000	1000	100
4-Methyl-2-pentanone (MIBK)	1000	1000	50
Methylene Chloride	49	210	1
Styrene	23	97	100
1,1,1,2-Tetrachloroethane	170	310	1
1,1,2,2-Tetrachloroethane	34	70	1
Tetrachloroethylene	4	6	1
Toluene	1000	1000	500
1,1,1-Trichloroethane	210	1000	50
1,1,2-Trichloroethane	22	420	1
Trichloroethene (TCE)	23	54	1
Vinyl chloride	2	7	10
Xylenes (Total)	410	1000	10
Base/Neutral Extractables			
Acenaphthene	3400	10000	100
Anthracene	10000	10000	100
Benzo(b)fluoranthene	.9	4	50
Benzo(a)anthracene	.9	4	500
Benzo(a)pyrene (BaP)	.66	.66	100
Benzo (k)fluoranthene	.9	4	500
4-Chloroaniline	230	4200	
Bis(2-chloroethyl)ether	.66	3	1
Bis(2-chloroisopropyl)ether	2300	10000	10
Bis(2-ethylhexyl)phthalate	49	210	100
Butylbenzyl phthalates	1100	10000	100
Chrysene	9	40	500
Dibenz(a,h)anthracene	.66	.66	100
Di-n-buthyl phthalate	5700	10000	100
Di-n-octyl phthalate	1100	10000	100

Table 2 (continued)

1,3-Dichlorobenzene	5100	10000	100
1,4-Dichlorobenzene	570	10000	100
3,3'-Dichlorobenzidine	2	6	100
1,3-Dichloropropene (cis & trans)	4	5	1
Diethyl phthalate	10000	10000	50
Dimethyl phthalate	10000	10000	50
Fluoranthene	2300	10000	100
Fluorene	2300	10000	100
Hexachlorobenzene	.66	2	100
Hexachlorobutadiene	1	21	100
Hexachlorocyclopentadiene	400	7300	100
Hexachloroethane	6	100	100
Indendo(1,2,3-cd)pyrene	.9	4	500
Isophorone	100	10000	50
Naphthalene	230	4200	100
Nitrobenzene	28	520	10
N-Nitrosodiphenylamine	140	600	100
N-Nitrosodi-n-propylamine	.66	.66	10
Pyrene	1700	10000	100
1,2,4-Trichlorobenzene	68	1200	100
Acid Extractables			
4-Chloro-3-methyl phenol	10000	10000	100
2-Chlorophenol	280	5200	10
2,4 Dichlorophenol	170	3100	10
2,4-Dimethyl phenol	1100	10000	10
2,4-Dinitrophenol	110	2100	10
2-Methylphenol	2800	10000	
4-Methylphenol	2800	10000	
Pentachlorophenol	6	24	100
Phenol	10000	10000	50
2,4,5-Trichlorophenol	5600	10000	50
2,4,6-Trichlorophenol	62	270	10
PAH's			
Acenaphthene	3400	10000	100
Anthracene	10000	10000	100
Benzo(b)fluoranthene	.9	4	5
Benzo(a)anthracene	.9	4	500
Benzo(a)pyrene (BaP)	.66	.66	100
Benzo (k)fluoranthene	.9	4	500
Chrysene	9	40	500
Dibenz(a,h)anthracene	.66	.66	100
Fluoranthene	2300	10000	100
Fluorene	2300	10000	100
Indendo(1,2,3-cd)pyrene	.9	4	500
Isophorone	1100	10000	50
Naphthalene	230	4200	100
Pyrene	1700	10000	100
Metals			
Antimony	14	340	
Arsenic	20	20	
Barium	700	47000	
Beryllium	1	1	
Cadmium	1	100	
Copper	600	600	
Lead (Total)	100	600	
Mercury (Total)	14	270	

Table 2 (continued)

Nickel (Soluble salts)	250	2400	
Selenium (Total)	63	3100	
Silver	110	4100	
Thallium	2	2	
Vanadium	370	7100	
Zinc	1500	1500	
Pesticides/PCBs			
Aldrin	.04	.17	50
4,4'-DDD (p,p'-TDE)	3	12	50
4-4'-DDE	2	9	50
4-4'-DDT	2	9	500
Dieldrin	.042	.18	50
Endosulfan	340	6200	50
Endrin	17	310	50
Heptachlor	.15	.65	50
Lindane	.52	2.2	50
Methoxychlor	280	5200	50
PCBs	.49	2	50
Toxaphene	.1	.2	50
Other			
Benzyl Alcohol	10000	10000	50
Cyanide	1100	21000	

Table 3
Potential Location Specific ARARs
Hecules Incorporated - SWDA

Location	Citation	Requirement	Comments
Within 100-yr Floodplain	N.J.A.C. 7:26-10.3 40 CFR 264.18(b)	Hazardous waste facilities must be designated, constructed, operated & maintained to avoid washout " "	Construction of any RCRA treatment, storage, or disposal facilities will have to meet these requirements " "
Within Floodplain	Executive Order 11988, Protection of Floodplains, (40 CFR 6, Appendix A)	Action to avoid adverse effects, minimize potential hazard, restore & preserve natural & beneficial values	Actions in floodplains will have to meet these requirements
Flood Hazard Areas	Flood Hazard Area Regulations (N.J.A.C. 7:13) Flood Hazard Area Control Act (N.J.S.A. 58:16A-50)	Actions to minimize hazards & adverse effects of construction &development activities " "	Activities in delineated wetland areas will have to meet these requirments " "
Wetlands	Freshwater Wetlands Protection Act and Rules (N.J.S.A. 13.9B, N.J.A.C. 7:7A) Executive Order 1190, Protection of Wetlands (40 CFR 6, Appendix A)	Actions to minimize the destruction, loss, or degredation of wetlands " "	Activities in delineated wetland areas will have to meet these requirements " "
Area Affecting Stream or River	Fish and Wildlife Coordination Act (16 U.S.C. 66 et seq.); 40 CFR 6.302)	Action to protect fish or wildlife	The Fish and wildlife Coordination Act requires consultation with the Dept. of Fish & Game prior to any action that would alter a body of water of the US

Table 4
Summary of Detailed Evaluation of Remedial Alternatives
Hercules Incorporated - SWDA

	Site-Wide Alternatives				North Ditch Alternatives		
Evaluation Criteria	1 No Action	2 Limited Action	3 In-Place Containment	4 SW and Tar Incineration	ND-1 No Action	ND-3 Filling	ND-4 Dredging & Restoration
Overall Protection of Human Health & the Environment	Low	Low to Moderate	High	High	Moderate	Low to Moderate	Moderate
Compliance with ARARS	Low	Low	Low	Low to Moderate	Low	Low	Low to Moderate
Long-Term Effectiveness	Low	Low to Moderate	High	High	Moderate	Low to Moderate	Moderate
Reduction of Toxicity, Mobility, or Volume	None	None	Moderate	High	None	None	Low
Short-Term Effectiveness	High	High	Moderate	Low	High	Very Low	Low
Implementability	High	High	Moderate to High	Low	High	Moderate to High	Low to Moderate
Estimated Cost	$201,000	$478,000	$1,956,000	$36,875,000	$60,000	$364,000	$393,000

Table 5
Contaminants of Concern/Media of Concern
Hercules Incorporated - SWDA

	Media			
Maximum Concentrations/ Contaminants of Concern	Ground Water	Surface Water	Sediment	Fish Tissue
Benzene(6 ppm)				X
Toluene(20 ppm)				X
Cumene(710 ppm)			X	
Cumene(180 ppb)*	X			
Phenol(1.3 ppm)			X	
2,4/2,6 dinitrotoluene total (344 ppb)	X			
Diphenylamine(640 ppm)			X	
Chromium(692 ppm)			X	
Lead(5.80 ppb)		X		
Mercury(1.7 ppm)			X	
Nickel(75.6 ppm)			X	
Silver(16.7 ppm)			X	
Zinc(756 ppm)			X	

*below criteria of 300 ppb